A Basic Sleep Science

studies support this possibility, but cannot prove causation. Here, we examine the impact of experimental SR on adolescents in a driving simulator, considering whether that impact is moderated by the nature of the drive (urban/suburban vs. rural) or how vulnerable each adolescent is to attentional decline after SR.

Methods: 17 healthy 16-18-year-old licensed drivers completed, in randomly counterbalanced order, two 5-night sleep conditions: SR (6.5 hours in bed) vs. Healthy Sleep (HS; 10 hours in bed). At the end of each, adolescents completed rural and urban/suburban courses in a driving simulator, and parents rated adolescents on a validated attention questionnaire. Vulnerability to SR was computed as raw score difference in those parent ratings across the sleep conditions. Outcome variables included mean speed, standard deviation of speed, standard deviation of lateral lane position (SDLP) and crashes. Separate multivariate models examined the main and interaction effects of sleep condition, type of drive, and vulnerability to SR, covarying for months licensed.

Results: Adolescents averaged 2 hours more sleep during HS than SR, p < 0.001. Although effects for the other driving outcomes were non-significant, there were 3-way interactions (sleep-by-drive-by-vulnerability) for mean speed and SDLP (p < 0.02). During the rural drive, adolescents had less consistent lateral vehicle control in SR than HS, despite slower driving among those reported to be vulnerable to SR. During the urban/suburban drive, SR worsened SDLP only among adolescents reported to be vulnerable to SR.

Conclusion: Even a moderate degree of SR appears to be a modifiable contributor to adolescent driving problems. This impact is widely present during boring rural drives, and in a subgroup during interesting urban/suburban drives.

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0362
DO 10MIN NAPS BEFORE THE COMMUTE HOME FROM A NIGHT SHIFT CAUSE SLEEP INERTIA?

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Introduction: Driving home after a night shift is associated with increased risk of road accidents. Napping may be used as a sleepiness countermeasure before the commute. The potential for sleep inertia after a pre-commute nap, however, has not been investigated.

Methods: Twenty-one healthy subjects (21-35 y; 12F) participated in a 3-day laboratory study including one baseline sleep opportunity (2200 h-0700 h) and one experimental night involving randomization to one of two conditions: total sleep deprivation (NO-NAP), or a 10 min nap ending at 0400 h plus a 10 min nap ending at 0710 h (10-NAP). This analysis focussed on performance following the 10 min nap ending at 0710 h, simulating a pre-commute nap. Nap sleep was recorded using polysomnography. A 40 min York monotonous highway driving task was performed at 0715 h. The standard deviations of road position and speed were analysed. Further, a 3 min psychomotor vigilance task (PVT) was administered pre-nap (0630 h), post-nap (0712 h), and post-drive (0755 h). PVT mean reciprocal response times (MRRT) were analysed.

Results: Total nap sleep time (mean ± SD) was 9.1 ± 1.2 min, with 1.3 ± 1.9 min spent in slow wave sleep. Mixed-effects ANOVA revealed a significant condition*time interaction (F1, 14 = 6.86, p = 0.017) for PVT MRRT. There was no difference pre- to post-nap in the NO-NAP condition. However, post-nap performance in the 10-NAP condition was significantly worse than pre-nap, and worse than the NO-NAP condition post-nap. Driving performance did not differ significantly between conditions. There were also no differences between conditions for PVT MRRT post-drive.

Conclusion: There were no group differences in PVT MRRT before the pre-commute nap (0630 h), which suggests that there were no significant carry-over effects of the 10 min nap at 0400 h. However, the PVT administered after the pre-commute nap detected signs of sleep inertia. The 40 min driving task that started immediately following, and the PVT administered right after, did not show evidence of sleep inertia—nor did they show benefits from the pre-commute nap.

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XIII. Sleep Deprivation

0363
A COMPARISON OF SLEEP AND PERFORMANCE OF US NAVY SAILORS ON FOUR DIFFERENT SHIFTS WORK SCHEDULES

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Introduction: The naval environment is characterized by sleep problems, sleep deprivation and elevated fatigue. The daily work and rest schedules for crewmembers is under the control of the ship’s commanding officer and consequently, varies from ship to ship. In this naturalistic experiment, we examined the sleep patterns and psychomotor vigilance performance of sailors on 4 different work and rest schedules.

Methods: Crewmembers on DDG-109 were observed for two weeks on either a “3 hrs-on/9 hrs-off” (n = 24) or a “6 hrs-on/6 hrs-off” (n = 9, Operations Department). Crewmembers (n = 34) on DDG-65 were observed for one week on a backward-rotating “6 hrs-on/18 hrs-off” schedule. On CNV-68, 77 crewmembers (Nuclear Reactor department) were observed for two weeks on a “5 hrs-on/10 hrs-off” schedule. Each sailor wore an actigraph, completed an activity log, and performed a 3-minute psychomotor vigilance test (PVT) before and after standing watch. A between-subjects comparison assessed differences in daily sleep and PVT performance among the watchstanding schedules.

Results: Crewmembers on the 5 hrs-on/10 hrs-off received significantly more daily sleep (6.88 ± 0.89 hours) than those on the modified 6-on/18-off (5.65 ± 1.63 hours) and those on the 6 hrs-on/6 hrs-off (5.90 ± 0.90 hours) schedules (all comparisons, p < 0.05). Their sleep was comparable to sailors working the 3 hrs-on/9 hrs-off (6.5 ± 0.8 hours). However, sleep on the 5 hrs-on/10 hrs-off schedule occurs in irregular, circadian misaligned times of the day. Over an entire 3-day rotation cycle, a crew member on the 5 hrs-on/10 hrs-off encounters two 20-hour periods of sustained wakefulness and one night of short sleep (4.4 hours). The 5 hrs-on/10 hrs-off schedule was associated with the worst PVT performance (mean reaction time and 355 ms lapses) followed by the 6 hrs-on/6 hrs-off. The best performance was seen in the 3 hrs-on/9 hrs-off followed by the 6 hrs-on/18 hrs-off. PVT performance for both schedules was significantly better than the 5 hrs-on/10 hrs-off (p < 0.05).

Conclusion: The 5 hrs-on/10 hrs-off results in lower quality sleep than other schedules. In particular, the 3 hrs-on/9 hrs-off schedule yielded better sleep hygiene and better performance. The surface navy community should consider revising its watchstanding practices. This study suggests that watchstanding schedules based on sound human performance and ergonomics principles may lead to better performance in the operational environment.

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