

How Much Sleep Does an Elite Athlete Need?

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Introduction: Elite athletes typically report obtaining less than the recommended target of eight hours of sleep per night, but little is known about how much sleep they need each night to feel rested. The aim of this study was to identify the subjective sleep need of elite athletes and to compare it with an objective measurement of habitual sleep duration. **Methods:** A total of 175 elite athletes from 12 sports wore an activity monitor and completed a sleep diary for a minimum of four nights during a normal phase of training. The data from the activity monitor and sleep diary were used to calculate habitual sleep duration for each athlete. Sleep need was assessed prior to data collection with the question ‘how many hours of sleep do you need to feel rested?’. Sleep deficit was then calculated for each athlete by subtracting habitual sleep duration from sleep need. Paired t-tests were conducted to detect a difference between sleep need and sleep duration. **Results:** On average, athletes’ subjective sleep need was 8.3 ± 0.9 h and their mean habitual sleep duration was 6.7 ± 0.8 h. There was a significant difference between sleep duration and sleep need [$t(168) = -19.2$, $p < 0.0001$]; and this difference was observed in most sports (basketball, road cycling, rugby union, track cycling, triathlon, Australian Rules football, soccer, cricket, swimming) but not all (mountain biking, race walking). The mean sleep deficit (i.e., discrepancy between sleep need and sleep duration) was 1.6 ± 1.0 h. Only 3% of athletes met their required sleep need.

Conclusions: A majority of elite athletes fall short of their sleep need by one hour or more. Insufficient or inadequate sleep, defined here as a failure to meet a required sleep need on a regular basis, could have important consequences for an elite athlete, particularly in terms of their ability to train effectively and/or compete at their best.

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Comparison of Fatigue among Flight Crews during the Night - Night Flights Versus the Night - Early Morning Flights by Single Operations in Japanese Major Airline Companies

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Introduction: In 2017, we reported a paper that “A preliminary questionnaire study on fatigue of long-haul commercial flight crew members”. In that paper, the fatigue of air crews was evaluated by whether long-haul operation, two-men operations, night flights, WOCL (Windows of Circadian Low), time differences and early morning operations exist or not. The results showed that higher fatigue in flights of the Haneda -Sydney and the Haneda -Vancouver than other flights. Therefore, purpose of the present study is that we assess fatigue of crews in these flights by objective measurements. **Methods:** Fifteen captains and 9 first officers participated (mean age; CAP = 49.9 yrs., FO = 33.4 yrs.). They completed 5-min psychomotor vigilance task and the Samn - Perelli Fatigue scales at pre- and post-flight during round-flights in Haneda - Sydney or Haneda - Vancouver. One of captains wore an actigraphy during every operation and sleep. The Haneda - Sydney flights were nighttime operations for round trips without time differences. Meanwhile, the Vancouver flight was operated at night on the outbound route, early morning flight on the inbound route, and there was a time difference. **Results:** Two-way ANOVAs for Samn - Perelli Fatigue scales showed more tired Sydney flights than Vancouver flights ($p < 0.0001$), and also showed flights (to Sydney or Vancouver) \times routes (outbound or inbound) interaction ($p = 0.011$). However, there were no significant differences in any parameters of PVT. **Discussion:** The reason that no differences in any PVT parameters was that pilots could take naps. The other hands, differences in SP-scale assumed that caused by psychological burden that pilots had no choice but to take prophylactic naps even if at inappropriate circadian rhythms for safety before inbound flights. We concluded that at least augmented crews should be need at night flights.

Culture Change in the US Navy: From Data Collection to Mandated Policies

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Introduction: Since 2001, the Naval Postgraduate School Crew Endurance Team has conducted numerous studies on more than 30 surface combatants of the United States Navy (USN) to document the sleep patterns and performance of Sailors. The aim of this multi-year effort was to determine which watchstanding and work schedules are most effective while crews are underway, and to provide actionable recommendations to the US Navy leadership. **Methods:** All studies were naturalistic and longitudinal. Sailor (N=1269) well-being and performance was assessed in terms of sleep-related attributes (both subjectively and objectively using actigraphy), fatigue, insomnia symptoms,

mood states, performance in the Psychomotor Vigilance Task, and work hours. **Results:** Compared to non-circadian watchbills (i.e., rotating watchstanding schedules leading to a non-24-hour work/rest pattern), circadian-based watchbills (i.e., fixed watchstanding schedules with work/rest patterns resulting in a 24-hour day) and watchbills with more sections were associated with higher alertness, less severe insomnia symptoms, better sleep quality, better mood, and better psychomotor vigilance performance. That is, crewmembers on circadian-based schedules responded faster and made fewer errors than their counterparts who were on non-circadian-based schedules. Notably, differences between circadian and non-circadian watchbills were more pronounced in 3-section compared to 4-section watchbills. **Discussion:** These results validate the operational utility of circadian-based watchbills. In contrast, non-circadian-based watchbills should be avoided if at all possible. The efficacy of circadian-based watchbills is even greater when manning is limited, i.e., when ship's company cannot support the use of 4-section watchbills. Our recommendations informed the fleet-wide directive to implement circadian-based watchbills onboard all US Navy surface ships. In parallel, the development of crew endurance and sleep hygiene training programs was initiated to support commands improve shipboard operational performance.

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Effect of a High-Protein Meal during a Night Shift on the Food Consumption Pattern the Following Day: A Randomized Crossover Study with Fixed Night Workers

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Introduction: Night workers are more likely to have obesity and its associated diseases. Studies suggest that food choices at night is a key contributor to the increased risk of weight gain among these individuals. Thus, the development of strategies to avoid an inadequate nutritional status related to food intake at night are required. The aim of this study was to compare the acute effect of a high-protein versus normal protein meal served at night on the feeding behavior the following day. **Methods:** The study was conducted with 14 male nurses. After being followed-up for 7 days before each night intervention in relation to eating and sleeping habits, participants underwent two different isocaloric dietary conditions at 1:00 h of the night shift, with a 6-day washout

period between them: high-protein (HP) meal containing 45% carbohydrate, 35% protein and 20% fat; and normal protein (NP) meal containing 65% carbohydrate, 15% protein and 20% fat. Participants answered a food register of all food consumed the following day after intervention. Generalized estimating equations analyses were used to examine the effect of each meal test on food consumption of energy and macronutrients. **Results:** Compared to NP intervention, HP intervention led to a higher percentage of carbohydrate consumption in the lunch and lower percentage of fat consumption in the dinner the following day (48.14% versus 36.98% and 27.34% versus 40.39%, respectively). For all other meals evaluated, we did not find differences between nutritional interventions. **Discussion:** Eating a high protein meal at night leads to changes in the pattern of food consumption the next day.

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'No Time to Eat': A Qualitative Study about Nurses' Food Intake, Shift Work and Gender

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Introduction: Few studies highlight the importance of the relationship between shift work and food intake correlating aspects such as calories intake with metabolic problems. **Objective:** This study aimed to report female nurses' perceptions about how their food intake is influenced by their shift work and gender aspects, especially houseworking and motherhood. **Methods:** This qualitative study was conducted at a public maternity hospital located in São Paulo - Brazil. Data was gathered by ethnography and 10 in-depth interviews performed with female shift work nurses. The data collection was organized as two types of database: 'Field Journals' and 'Interviews Database'. Analytic process was performed by 'Triangulation Method' according to the conceptual framework of hermeneutical referential. **Results:** Day shift nurses explained two major problems to establish a regular schedule of meals that was conciliate houseworking and their shift, that demanded early waking up and late bed time at night. The main challenge for the night shift nurses was to bring health food to work and keep a meal schedule during the day, even because there were no places to eat nearby the maternity. We also observed impairments in order to balance their housekeeping and resting time. **Discussion:** According to the nurses perceptions, for both groups, not having meal options at/ or close to work made their food intake harder or less healthy. Besides that,