
TS 2.3

LIGHT AND ALERTNESS: IS THERE AN ALTERNATIVE TO BLUE?

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Introduction: Rotating-shift nurses are typically entrained to a day-shift schedule; therefore, coping with night-shift becomes harder as a result of the natural tendency to be asleep at night. Studies have shown that exposure to high levels of bright light at night (levels typically > 2500 lux at the cornea) increases alertness, measured subjectively and objectively and positively affects certain types of performance tests⁽¹⁾. The suppression of melatonin by light at night may mediate the positive effects of light on nocturnal performance and alertness. However, acute melatonin suppression or disruption of the melatonin cycle by light at night has been linked to increased risk of cancer in animal models. Therefore, while there is a benefit of exposing shift workers to light at night, the long-term side effects of this light exposure are still not fully quantified. The goal of this series of studies was to test whether narrowband long-wavelength (630-nm) light, which does not suppress melatonin, can positively impact measures of alertness and performance.

Methods: A series of nighttime studies were performed where measures of objective (electroencephalography) and subjective (Karolinska Sleepiness Scale) alertness as well as performance were collected while subjects either remained in darkness or were exposed to short-wavelength (470-nm), long-wavelength (630-nm) or “white” (2700 K) lights. Data were collected in the early evening, at the middle of the night, and at end of the night.

Results: Exposures to 470-nm and 630-nm lights in the middle of the night increased beta and reduced alpha power relative to preceding dark conditions, although only 470-nm light significantly suppressed melatonin relative to darkness⁽²⁾. Both 470-nm and 630-nm lights significantly increased nighttime cortisol levels, heart rate, and reduced reaction times in the psychomotor vigilance test. In a follow-up experiment, we showed that both 630-nm and 2700 K lights decreased reaction times on a GONOGO task, while there was no significant difference in auditory reaction times after exposure to 630-nm light and 2700 K light compared to darkness. Compared to darkness, alpha and alpha theta power was significantly reduced after 630-nm light exposure, but not after 2700 K light.

Conclusions: Our findings suggest that the melatonin pathway does not seem to be the only light-sensitive pathway that can affect alertness and performance at night^(3,4). Long-wavelength light can positively affect measures of performance and alertness without suppressing melatonin. These lighting solutions need to be tested in the field.

Sponsor: Office of Naval Research

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TS 2.4

HOW TO USE LIGHT AND DARK TO ADAPT TO SHIFTWORK

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The sleep, performance, health, and safety problems associated with shift work are caused by circadian misalignment between the internal circadian clock and activities such as work, sleep and eating. The typical countermeasures, such as caffeine and other stimulants, sedatives to facilitate daytime sleep, naps, and education about sleep hygiene and circadian rhythms, are the components of most fatigue risk management plans. These approaches have limited benefits because they do not address the underlying cause of the problems which is circadian misalignment. I will review studies in which we reset (phase shifted) the circadian clock to partially align with a night work, day sleep schedule by controlling exposure to light and dark. This method includes sleep in the dark soon after night shifts, sleep scheduled late on days off, a little bright light during night work to help delay the circadian clock, sunglasses on the way home from the night shift to attenuate phase advancing light, and outdoor light exposure (the light brake) after waking in the afternoons to keep the clock from delaying too far. We structure the time for sleep after night shifts and sleep on days off, so that their times partially overlap. The light dark schedule delays the circadian clock so that the sleepest time of day, which occurs around the body temperature minimum, falls within this overlap. Thus, sleep can be improved when it occurs during the daytime after the night shifts as well as on days off. Delaying the sleepest time of day out of the time for night work and into the daytime sleep time also improves night shift performance. I will give some practical advice on how to implement this type of schedule.

This research was supported by grant R01OH003954 from the United States National Institute for Occupational Safety and Health (NIOSH) of the Centers for Disease Control and Prevention (CDC). The contents are solely the responsibility of the author and do not necessarily represent the official views of NIOSH or the CDC.

3rd Thematic Session Socially Sustainable Working Hours

TS 3.1

SELF-ROSTERING - A WAY TO SOCIALLY SUSTAINABLE WORKING HOURS

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Objective: The aim was to explore the effects of self-rostering on health, recovery, work-family balance and psychosocial work environment. We also elucidate the mechanisms through which recovery and health are affected and interpret the results in light of the different implementation processes.

Methods: A prospective, quasi-experimental intervention study with a 12 months follow-up was conducted. Twenty eight workplaces were allocated to either an intervention implementing self-rostering or reference group. Intervention A encompassed possibilities to specify preferences for starting time and length of shift down to 15 minutes intervals. In interventions B and C employees could choose between a number of predefined duties.

In interventions A and C, but not B, employees were invited to solve discrepancies between preferences and need for resources by voluntarily altering their preferences after the first schedules had been made. A total of 1065 participants (response rate = 79%) were included at baseline and 1074 at follow-up (response rate = 73%). Information on sleep, need for recovery, work-family balance and psychosocial work environment was obtained from questionnaires. Process evaluation encompassed interviews at baseline and

VOLUME 6

SUPPLEMENT

1

2013

A publication of Associação Brasileira do Sono (ABS) and Federação Latinoamericana de Sociedades do Sono (FLASS)

ISSN Print 1984-0659
ISSN On-line 1984-0063



Associação
Brasileira
do Sono

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