

Abstracts on Shift Work

Czeisler C, Johnson M P, Duffy J F, Brown E N, Ronda J M, Kronauer R E.

Exposure to bright light and darkness to treat physiologic maladaptation to night work.

The New England Journal of Medicine 1990; 322:1253-9

Working at night results in a misalignment between the sleep-wake cycles and the output of the hypothalamic pacemaker that regulates the circadian rhythms of certain physiologic and behavioural variables. We evaluated whether such physiologic maladaptation to nighttime work could be prevented effectively by treatment regimen of exposure to bright light during the night and darkness during the day. We assessed the function of the circadian pacemaker and in five control and five treatment studies in order to assess the extent of adaptation in eight normal young men to a week of night work. We conclude that maladaptation of the human circadian system to night work, with its associated decline in alertness, performance and quality of daytime sleep, can be treated effectively with scheduled exposure to bright light at night and darkness during the day.

Campbell SS.

Effects of timed bright-light exposure on shift-work adaptation in middle-aged subjects.

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Shift workers suffer from a constellation of symptoms that can severely compromise their ability to perform optimally on shift. The largest single factor contributing to shift-worker problems is sleep disturbance, and there is little question that the primary cause of such sleep disturbance is circadian disruption. Recently, a number of studies have demonstrated that timed exposure to bright light can help facilitate adaptation to simulated shift-work schedules, at least in younger subjects. The aim of the current study was to assess the effects of bright-light interventions in middle-aged individuals undergoing a simulated shift-work regimen. Results indicate that although light was effective in resetting the circadian clocks of these subjects by more than 6 hours, there was little effect on the measures of on-duty alertness and performance or on off-duty sleep. These findings suggest that middle-aged subjects may be less phase-tolerant than young subjects, and they raise questions concerning the utility of bright-light interventions in some shift-work populations.

Stewart K T, Hayes B C, Eastman C I.

Light treatment for NASA shiftworkers.

Department of Psychology and Social Sciences, Rush-Presbyterian-St Luke's Medical Centre, Chicago, Illinois, USA. Chronobiol Int, 1995 Apr, 12:2, 141-51.

Intense artificial light can phase-shift circadian rhythms and improve performance, sleep and well-being during shiftwork simulations. In real shiftworkers, however, exposure to sunlight and other time cues may decrease the efficacy of light treatment, and occupational and family responsibilities may make it impractical. With these considerations in mind, we designed and tested light-treatment protocols for NASA personnel who worked on shifted schedules during tow Space Shuttle missions. During the prelaunch week, treatment subjects self-administered light of approximately 10,000 lux at times of day that phase-delay the circadian rhythms. Treatment continued during the missions and for several days afterwards. No treatment was administered to subjects in the control group. Treatment subjects reported better sleep, performance and physical and emotional well being than control subjects and rated the treatment as highly effective for promoting adjustment to their work schedules. Light treatment is both feasible and beneficial for NASA personnel who must work on shifted schedules during Space Shuttle missions.

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How to use light and dark to produce circadian adaptation to night shift work.

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The circadian rhythms of night shift workers do not usually adjust to their unusual work and sleep schedules, reducing their quality of life and producing potentially dangerous health and safety problems. This paper reviews field studies of simulated night work in which shifted light-dark cycles were constructed with artificial bright or medium-intensity light to produce circadian adaptation, i.e. the shifting of circadian rhythms to align with night work and day sleep schedules. By using these studies we describe fundamental principles of human circadian rhythms relevant to producing circadian adaptation to night shift work at a level designed for the reader with only a basic knowledge of circadian rhythms. These principles should enable the reader to start designing work/sleep-light/dark schedules for producing circadian adaptation in night shift workers. One specific schedule is presented as an example. Finally, we discuss phase-response curves to light and clarify common misconceptions about the production of circadian rhythm phase shifts.

Kuller R.

The influence of light on circarhythms in humans. J Physiol Anthropol Appl Human Sci. 2002 Mar;21(2):87-91.

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The present review discusses two types of biological rhythms, namely, circadian rhythms and circannual rhythms. Humans possess a circadian rhythm of approximately 24 hours, which is regulated by neural and hormonal processes. The synchronisation of this rhythm with the solar day and night is maintained through entrainment mainly by light. Dark environments completely lacking windows may have a negative effect on well-being and work capacity. During shift work the biological clock tends to maintain its normal 'diurnal' rhythm, which may lead to extreme tiredness and increased risk of accidents. Negative effects such as these may be partially alleviated by means of bright light during the night. During air travel across several time zones there is little time for the biological clock to adjust, but the resulting 'jet lag' may possibly be overcome by means of appropriately timed exposure to bright light. In countries situated far from the equator, the biological clock may become seriously disrupted during the short days of the dark season. Characterised by fatigue, sadness and sleep problems, these seasonal affective disorders may be cured or alleviated by means of regular periods outdoors, better lighting indoors, or, in the most serious cases, light therapy.