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Black Plastic and Sunglasses Can Help Night Workers

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Introduction: Night shift workers are forced to work and sleep during the "wrong" phase of the circadian cycle causing serious problems such as reduced alertness during work and disturbed sleep during the day. Field studies of simulated night work show that using artificial bright light at night and constructing periods of darkness for sleep during the day can help phase shift the circadian clock to adjust to night work, day sleep schedules (1). Wearing dark sunglasses while traveling home (1) and melatonin (2) can also facilitate circadian adaptation. Our ongoing study tests various combinations of these interventions to phase delay circadian rhythms to align with a night work, day sleep schedule. This will be a 3-year study. We are reporting the first year of data, which were collected during the summer.
Methods: Thus far, 24 healthy young adults participated. They work 5 consecutive simulated night shifts (23:00 to 07:00) and sleep at home (08:30 to 15:30). We tape black plastic over their bedroom windows to make it dark. Subjects are required to stay in bed, in the dark for the full 7 hours. This daily dark sleep episode is the building block for all combinations of interventions and others are added in order of the least amount of effort for the worker. There are 5 intervention groups (see Table). During the night shift, subjects are exposed to a moving pattern of intermittent bright light (~ 5000 lux, 20 min of some hours) or dim light (~ 200 lux). While traveling home, subjects wear gray or black sunglasses (transmit 15% or 2% of light respectively). Subjects take a placebo or melatonin pill (1.8 mg sustained release) before daytime sleep. This timing of melatonin is predicted to help phase delay circadian rhythms, and we also expect a soporific effect. There is a circadian phase assessment before and after the night shifts in which subjects give saliva samples every half hour that are analyzed for melatonin. Phase is measured by the endogenous dim light melatonin onset (DLMO). Subjects fill out sleep logs and wear wrist activity monitors.
Results: The average sleep onset was 1:48 ± 1:12 during 7 days of baseline and 8:42 ± 0:12 during daytime sleep, a delay of 6.9 ± 1.1 hours. The phase delay in the DLMO was large in all groups, and increased as interventions were added (see Table). Subjects slept for almost the full 7 hours during the daytime sleep episode (6.7 ± 0.4 hours) and there was no difference among groups.

Intervention Group	N	Phase Shift of DLMO Hours, Mean (SD)
1. D + GS	7	-4.6 (2.9)
2. D + BS	2	-4.7 (1.9)
3. D + BS + M	4	-5.2 (1.0)
4. D + BS + BL	6	-6.5 (1.1)
5. D + BS + M + BL	5	-7.0 (1.2)

D=dark sleep episode; **GS**=Gray Sunglasses; **BS**=Black Sunglasses; **M**=melatonin; **BL**=bright light

Conclusions: These data suggest that the combination of all interventions induces the greatest phase delay in the circadian clock. However, a fair amount of re-alignment between circadian rhythms and the night work, day sleep schedule took place with only a dark, regular daytime sleep period and sunglasses during the commute home.

References:

1. Eastman CI and Martin SK. How to use light and dark to produce circadian adaptation to night shift work. Ann Med 1999;31:87-98.
2. Sharkey KM and Eastman CI. Melatonin phase shifts human circadian rhythms in a simulated night work study. J Sleep Res 2000;9 (suppl):173.

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