Sleep Therapy Headset for Improving the Sleep Quality of Older Adults

Between 40% and 70% of people over 65 suffer from chronic sleep disturbances. In particular, those with Alzheimer's disease (AD) may experience more aggravated disease symptoms from a lack of restful, consolidated sleep. Clinical research has shown that exposure to very bright light during the day and darkness at night can consolidate the rest and activity patterns in people with AD. LRC researchers tested the feasibility of an effective, comfortable light-treatment device that could be used to consolidate the rest/activity rhythms of older adults, including those with AD.

Experiment

Based on the knowledge that the circadian system is maximally sensitive to blue light, the LRC worked with Topbulb.com to develop light goggles that deliver at least 40 lux of blue light (λ_{max} = 470 nm) at the eye. LRC scientists measured nocturnal melatonin suppression—one measure of circadian stimulation—to gauge the effectiveness of the goggles. The goggles were calibrated to deliver enough blue light to achieve 25% and 60% melatonin suppression values. Seven subjects (age 50 and above) participated in the two-night experiment. Subjects arrived at the LRC laboratory at 10 p.m. and sat in dim red light (a condition known to not activate the circadian system). The goggles were turned on at midnight, and seven blood and saliva samples were taken over a 90-minute period, with the first two samples taken in the dim red lighting condition. The other five samples were taken while the subjects wore the goggles.

Sponsors

National Institute on Aging
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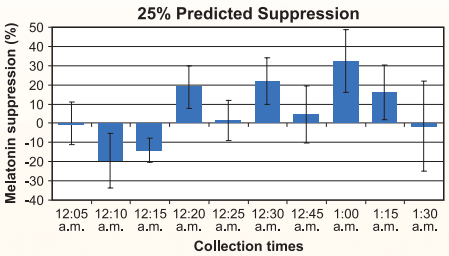
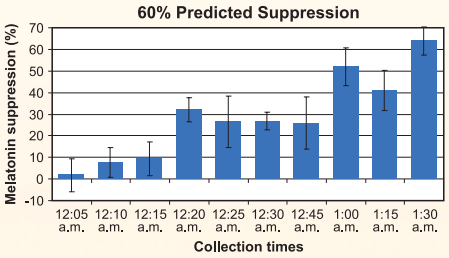
Results

Melatonin suppression was calculated by comparing each of the measurements taken after the goggles were turned on to the average of the two measurements taken in the dim red light. The figures show melatonin suppression resulting from exposures to the low blue light level (25% predicted suppression) and to the high blue light level (60% predicted suppression).



Percentage (avg. ±standard error of the mean [S.E.M.]) of melatonin suppression at low light levels for each measured time period.



Percentage (avg. ±S.E.M.) of melatonin suppression at high light levels for each measured time period.

Positive melatonin suppression was observed 20 minutes after exposure to the low blue light level and 5 minutes after exposure to the high blue light level. Suppression after exposure to the low light level took longer to initiate and was not maintained after 90 minutes, suggesting that the circadian system habituates to low light levels. This is evidenced by the rising melatonin levels found at the end of the low light exposure, which was not observed for the higher light exposure. The next steps will test the acceptance of these light goggles by older adults, including those with AD.

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Lighting Research Center

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