

SomnIA Briefing Paper 7

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Investigating the Effect of Light on the Sleep Quality of Community Dwelling Older People

The primary focus of Workpackage 5 within the SomnIA: Sleep in Ageing project is to examine the effect of light augmentation on sleep and activity in older people living in the community. Sleep problems increase with age which may be due to physiological changes involving the internal circadian system (body clock). The body clock is greatly influenced by daily light exposure so part of the problem may be the reduced amount of light older people

experience each day. This could be because they go outside less or have low lighting levels within their homes. In addition, as we age changes in the eye reduce the amount of short wavelength blue light perceived. It is this short wavelength blue light that is known to have the greatest effect on the circadian clock system and our body's physiology. Thus there may be some benefits in increasing the amount of light, in particular blue light, that older people receive.

Control and Blue-Enriched Light

Our study has therefore investigated the effects of light supplementation on sleep, mood and alertness of older people who report having sleep problems. Study participants were required to sit in front of a light box for two hours in the morning and two hours in the evening for 3 weeks. Two types of light sources were investigated: a blue-enriched white fluorescent light (high colour temperature) and a control white fluorescent light (low colour temperature) (provided by Philips Lighting), at two different light intensities.

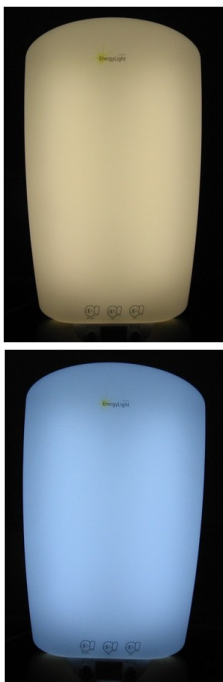


Figure 1: The light boxes: Control white light (above) and blue-enriched white light (below).

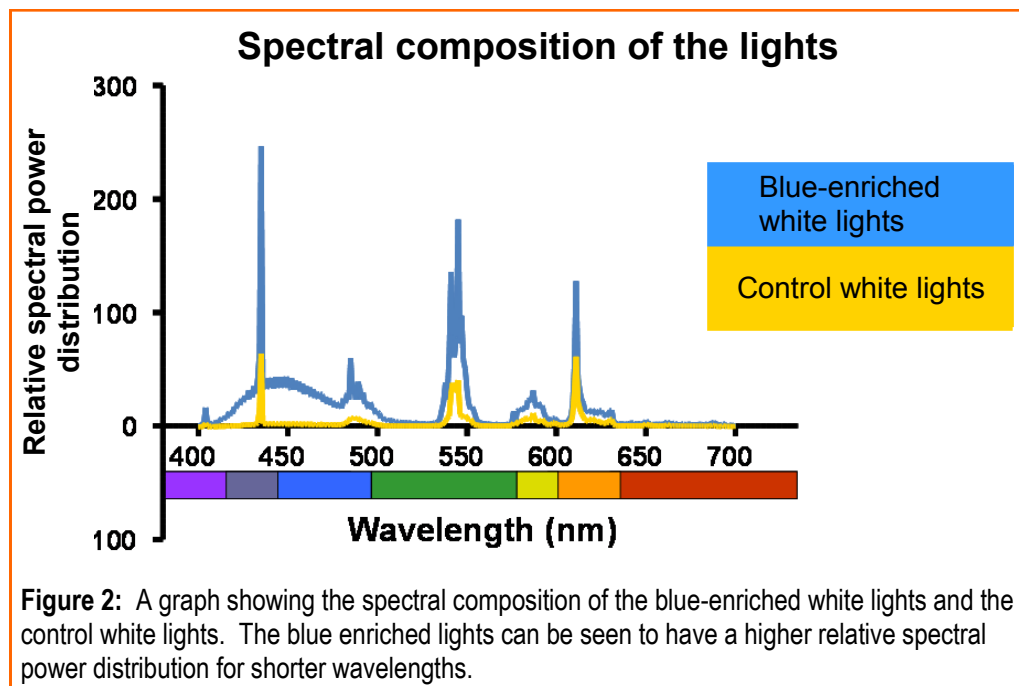


Figure 2: A graph showing the spectral composition of the blue-enriched white lights and the control white lights. The blue enriched lights can be seen to have a higher relative spectral power distribution for shorter wavelengths.

EXAMPLES OF DATA ANALYSIS

Figure 3: Wrist worn activity and light monitor showing light sensor (Actiwatch L).



Figures 4a and 4b: Actiwatch L actigraphy and light sensor data for a single participant over the same week.

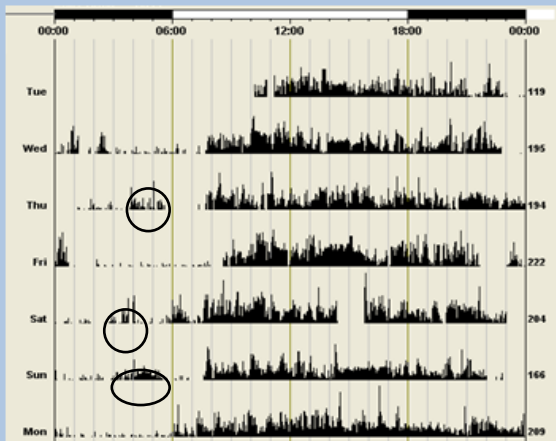
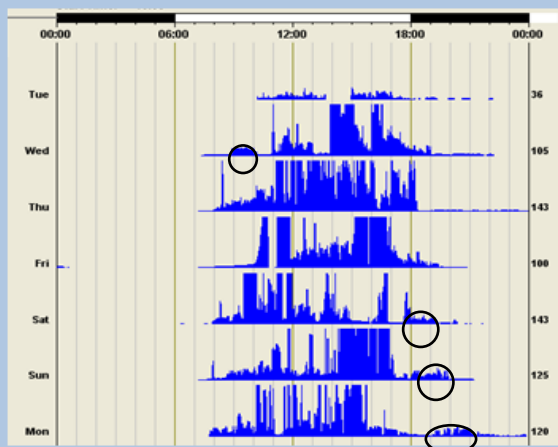


Figure 4a (above): The actigraphy shows the level of activity from midnight to midnight, every day for 7 days. In the daytime higher levels of activity are seen, than at night where activity is very low. However some night-time activity can be seen, indicating wakefulness.

Figure 4b (below): The light data are from an Actiwatch sensor worn around the neck. The graph shows the amount of light exposure from midnight to midnight, every day for 7 days. Some light sessions where the participant was seated in front of the light box can be seen.



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Study Design

All study participants were over 60 years old with self-reported sleep problems as assessed by a sleep questionnaire (Pittsburgh Sleep Quality Index score > 5). Thirty-three healthy individuals (10 males; 23 females) have completed the study, 12 people received the lower intensity lights (400 lux) and 21 people received the higher intensity (1100 lux) lights.

The study was eleven weeks long, starting with 1 week of baseline measurements, followed by 3 weeks of daily light exposure, followed by 2 weeks of 'washout' (no light exposure) for each light condition. Each person received both light conditions and it was randomised which one they received first. Study participants completed sleep diaries, mood and alertness questions every day and wore both an activity monitor on their wrist (Actiwatch-L) which assesses sleep, activity and light levels and a light sensor around their neck to measure light exposure continuously throughout the study.

Aims

The study hopes to understand the nature of sleep problems experienced by older people living at home. It also aims to assess the effect of light augmentation on people's sleep. If proven beneficial, lighting may offer a solution to reduce some of the detrimental effects of poor sleep.

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