KEY POINT SUMMARY

Blue-Enriched Lighting for Older People Living in Care Homes: Effect on Activity, Actigraphic Sleep, Mood and Alertness

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Key Concepts/Context

Residents of long-term care homes suffer from natural light deprivation and other age-related physical conditions. This includes changes in sleep patterns and a decrease in sleep efficiency. Lack of light exposure negatively affects circadian systems and consequently affects sleep. It was found that increased amounts of natural light positively affect residents' mood, reduce agitation, and regulate their circadian rhythm. While focus of light intervention studies was largely on dementia care patients, few studies have shown positive impacts of bright light on older population not suffering from dementia. However, there is a lack of light intervention studies on older populations not diagnosed with dementia.

Methods

This study was conducted at seven facilities in southeast England to compare blue-enriched white lights (high-color temperature-17000 K) to white lights (low-color temperature-4000 K) and their impact on 80 residents over a 12-week period. A therapeutic environment screening survey (TESS-NH) was carried out to qualify the selected care homes and to ensure that they were comparable using a randomized cross-over design. The study was started with the existing lights at the care homes with a one-week baseline period. It was followed by a four-week period for each of the blue-enriched and the white lights with a three-week separation period under the original lights. The lights were installed in communal areas used frequently, such as social lounges and the dining rooms. 80 residents who frequented the common areas were deemed eligible according to preset criteria, of which 69 were females. The study participants were allowed to answer as many questions as they were able to, with subgroups completing more in-depth questionnaires. They included questions on mood changes, alertness, and sleep patterns. The subgroups also wore activity monitors and did visual task testing.
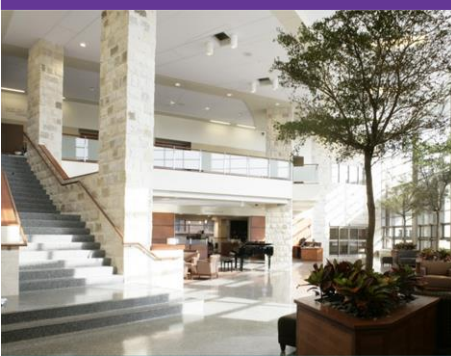
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Data was collected two days a week at each care home while keeping the days the same. Participants' subjective information was gathered using several scales to measure sleeplessness, alertness, anxiety, and depression as well as lux readings using Activwatch (AWL) and objective sleep parameters. The mini mental state exam (MMSE) was performed at the end of each light condition. In addition, subjective sleepiness was evaluated using the Karolinska sleepiness scale (KSS) and a 9-point scale and three 9-point subjective scales for mood changes. The hospital anxiety and depression (HAD) scale was administered every week. After each light treatment a subset study group was evaluated using the geriatric depression scale (GDS) and the Pittsburgh sleep quality index (PSQI). Seventy-three residents wore activity and light monitors (AWL) during the 12-week study period. At the end a statistical analysis was conducted using the data collected regarding the light treatment exposure of the participants. Eleven variables for activities were developed for each participant using parametric cosinor analysis and non-parametric circadian rhythm analysis (NPCRA). Objective sleep parameters were calculated using data received from the AWL, while psychomotor vigilance performance was measured using visual PVT.

Findings

The analysis showed that blue-enriched light increased the wake time and decreased sleep time of participants. In addition, there was more significant nighttime activity, while sleep quality was self-rated as being worse, causing more agitation. Overall the study found that the care home residents showed increased activity during the day and at night because of the blue-enriched light exposure. On the other hand, anxiety under the 17000 K light was self-rated as being lower during the daytime. No difference was noted under either light regarding depression, cheerfulness, calmness, alertness, and performance.

Limitations

Some limitations were noted by the authors regarding the subjective questionnaires as being inappropriate for small mood and sleep quality changes. Also, the participants were not required to be under the experimental lights while doing the mood and alertness evaluation. Overall the effects appeared small and mixed due to some shortcomings in the study design.

Design Implications

Despite being limited, the study findings could be applied to improve indoor lighting by introducing blue-enriched 17000 K lamps. Other studies reviewed by the authors provided an evidence-based approach to lighting design including staff work areas where alertness and cognitive abilities could be increased.