WHITE PAPER by BRAINLIT

ELDERLY CARE

The importance of lighting for the elderly

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BIOCENTRIC LIGHTING IN ELDERLY CARE

Demographic changes have made the need for professional and appropriate residents more important. The elderly have different needs in their homes compared to younger individuals. In care facilities, it is usual for people to spend the majority of time indoors. The need for light increases with age as the pupil gets smaller and the lens thickens absorbing more light. People with an advanced age need more intensive light to aid vision, and exposure to sufficient daylight is important in stimulating the diurnal rhythm. Inadequate lighting has been found to be a contributing factor to accidental falls causing hip fractures and damaging head injuries. Inadequate light increased the risk of a fall by 1,5 times[1]. Fall prevention where light is one part is thus an important consideration for the design of the homes of the elderly and in care facilities.

The circadian rhythm with an active daytime and a good night sleep is essential for a healthy and good life. The older we get the less time we spend outside in daylight. The opportunity for institutionalized elderly to synchronize their circadian clock to the solar day by daylight is often small.

The circadian rhythm directs the endogenous sleep hormone melatonin and the activation hormone cortisol which boosts energy and alertness in the morning. The amplitude of these hormones diminishes with age[2,3].

Among elderly, sleep related problems are common. Earlier bedtimes and wake-up times and frequent awakenings during sleep characterize nocturnal sleep patterns of older adults giving a more fragmented sleep with less quality.

Light to restore sleep

Several studies have investigated the effect of light stimuli aimed at improving nighttime sleep. Maanen et al. found that light therapy is effective in treating sleep problems[4]. In another recent review, the authors found that light, melatonin and acupressure showed the most promising results to restore a natural sleep-wake cycle[5] in long-term care settings.

Figueiro proposed based on the knowledge of how light impacts aging vision, at least 2 hours of 1000 lux during the day, or if longer exposure levels no less than 600 lux during the day, and no more than 60 lux at night[6].

Older people often go to bed early at night and wake up early in the morning. Besides phase-delaying effects of evening light exposure, light maintaining evening alertness might have potential in treating advanced sleep in aging adults[7].

Depression and light

A viscous circle of immobility and sleep problems can lead to depression. Many elderly experience periods of low temper and depression is sometimes the result. Light has shown to have a positive effect on mood.

A positive effect of a restored circadian rhythm through appropriate light has shown an expected preventive effect through a decrease of depressive symptoms. This seems to be a result of direct mood enhancing effects of light and indirect mood preventing effects through a restoration of the sleep-wake cycle[8].

Light therapy has been used for many years in the treatment of seasonal affective disorder. Studies are also being published showing a positive effect also for treatment of non-seasonal depression.

This is in line with a recent report by Chang where the researchers analyzed eight different studies investigating the efficacy of light treatment for depression among older adults. In this systematic review they found that depression severity significantly decreased after light therapy[9].

As light therapy before consisted of intense white light treatment with up to 10 000 lux, the discovery of the intrinsically photoreceptive ganglion cell with wave-length peak at around 460-480 nm opens up the way for lower more targeted light intensities.

Beneficial effects of light in Alzheimer's disease and dementia

Alzheimer's disease and related dementia (ADRD) is the most common mental disorder among elderly Americans.

As we get older the brain ages. There is a marked decrease in the total cell mass of the timekeeping center located in the suprachiasmatic nucleus in older people. This is even more pronounced in people with Alzheimer's disease and dementia. Abnormal sleep patterns seem to increase with the progression of ADRD.

Studies comparing healthy adults with patients with ADRD have revealed that the circadian rhythm is more disrupted among those with ADRD and that this disruption is more pronounced during the winter months[3].

In a medline search Figueiro et al. found several studies showing improved sleep-wake patterns and sleep duration following either light therapy (6 000-8000 lux) or increased illumination in the living environment[10].

A couple of studies also showed reduced agitation and nighttime activitiy among ADRD patients following exposure of morning light and yet another study showed greater effect of light than prescription of sleep medicines.

Alleviation of depressive symptoms in ADRD

Depression is common also among patients with ADRD and light has shown promising effects on these symptoms in this cohort as well.

In a 12-week study involving 77 patients with dementia, one group was actively exposed to increased daylight between 8-10 am each day, sitting minimum 3 m from the windows. They were compared with another group that was taken to a similar area but without active daylight exposure. Participants in the daylight intervention group experienced a decrease in depressive symptoms during the study[11].

In another study where bluish-white light was installed in 14 nursing home resident rooms designed to deliver circadian stimulation during the daytime, a significant reduction of depressive symptoms as well as increased total sleep time was seen. The authors conclude that lighting can be used to increase sleep quality and improve behavior in patients with ADRD[10].

Effect on cognition in ADRD

Light also seems to have an effect on cognition. One study with 15 seniors in long term care showed that 400 lux of blue light administered in the morning led to significant cognitive improvements[12].

Another study with more intense light administered between 9-11 am found improved MMSE (Mini Mental State Examination) scores especially in early stages of ADRD[6].

Summary

- Older people often do not get enough light to entrain their circadian rhythm
- Sleep related problems are common among elderly, especially among patients with ADRD
- Light can sustain the natural circadian rhythm leading to better night sleep and improved wellbeing
- Light may prevent development of depression
- Bright light at daytime can promote sleep at night and alleviate depressive symptoms among ADRD patients
- Blue light in the morning can besides promoting sleep at night also improve daytime cognition in ADRD patients

One of the biggest challenges with light in healthcare is the adaptability of the light solution to a workplace where multiple activities require different solutions for different rooms.

The BioCentric Lighting™ (BCL™) system is easily customized according to the unique needs of the individual workplace. The light environment provides patients and residents as well as the staff with the light that they need each day, regardless of season. Emerging research provide new understandings of the beneficial effects of light for improving sleep and wellbeing. The BCL™ system is easily adaptable to meet these new insights.

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