CIRCADIA

Light Therapy Efficacy Literature

The effect of light on sleep and our body clock

- Exposure to bright light suppresses melatonin (the sleep promoting hormone) and has circadian phase shifting characteristics [1-3]: It is able to advance or delay our internal body clock, and is naturally used by our body to align the internal clock with the day/night cycle, thus regulating sleep.
- The human circadian rhythm is most sensitive to short wavelength blue light [1, 2]. When white light is used, 185 times the intensity is required compared to blue light, to achieve the same effect [4].
- Light exposure and its impact on our physiology is time-dependent [5, 6]: Generally, light exposure in the morning advances the body clock, whereas light in the evening delays the body clock.
- Even 15-20 minutes [7] of exposure to blue light, with intensity as low as 90 corneal lux, is sufficient to cause a shift of the body clock and reset the sleep/wake cycle [8].

Light therapy for treatment of insomnia

- Light therapy is a standard treatment indication by the American Academy of Sleep Medicine (AASM) for treating those suffering from chronobiological aspects of insomnia. These include: delayed sleep phase syndrome, advanced sleep phase syndrome, irregular sleep/wake cycle, non-24-hour sleep-wake syndrome, jet lag, social jet lag, shift work, dementia, and sleep complaints in the healthy elderly [9, 10].
- A meta study including 53 studies and a total of 1154 participants, found that light therapy was effective in the treatment of sleep problems in general, and for circadian rhythm sleep disorders, insomnia, and sleep problems related to Alzheimer's disease/dementia specifically [11].
- A review concludes that there is sufficient evidence to warrant bright light therapy for the treatment of chronic sleep onset and early morning awakening insomnia [12].

Light Therapy for social jet lag

- Especially young people suffer regularly from insufficient (←7 hours) sleep on weekdays [13] and have a one to three hour delay in their sleep/wake timing [14, 15].
- This trend to staying awake in the evening and resulting discrepancy between the body clock and the day/night rhythm is known as social jetlag, and is associated with reduced sleep quality [16] and cognitive performance [17].
- Bright light therapy in the morning coupled with cognitive behavioural therapy, has been shown to increase total sleep time, result in earlier bed and rise times, and reduce daytime sleepiness [18, 19].

Red Light preventative therapy: Promotes sleepiness

- Increased light exposure at night, for example through electronic device usage, suppresses the production of melatonin, keeps the body alerted and thus results in increased sleep onset latency and reduced sleep quality [16, 20].

- However, long-wavelength red light does not suppress melatonin levels and therefore has minimal circadian phase shifting effects [21].
- Blue depleted ambient light in the evening has been shown to reduce both melatonin suppression and alertness, creating a better sleep environment and allowing the body to prepare for bed [22].
- It has been found that exposure to red light before bed can be highly effective to promote sleepiness and maintain regular sleep/wake cycles [23].

Daytime blue light therapy: Boost alertness and performance

- Daytime exposure to bright light has been shown to suppress melatonin levels, decrease sleepiness, increase subjective alertness and improve performance on tasks requiring sustained alertness and fast reaction times [24, 25].
- When testing the effect of blue-enriched white light in an office setting, it has been found that increased light exposure in the workplace leads to increased alertness, positive mood, increased performance, reduced irritability and increased concentration. Daytime sleepiness was reduced and participants reported better sleep during the night [26].

Blue light therapy for mood improvement

- Light therapy has been shown to raise levels of self-reported wellbeing and vitality in healthy people, particularly during winter time [27].
- Studies which have tested the efficacy of light therapy on patients suffering from seasonal affective disorder (SAD), found that light therapy caused a faster response and had fewer adverse effects than drugs [28].
- Low-intensity blue-enriched white light was found to be as effective as high intensity bright light in treating SAD [29]

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