Decreasing social jetlag with blue-light reducing glasses in the evening compared to blue-LED-light emitting glasses in the morning

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To elucidate in the same participants (late chronotypes with at least two hours of social jetlag) the changes in sleep timing, social jetlag and endogenous circadian phase of melatonin with more than two hours of social jetlag shielded from blue...

Ethical review	Approved WMO
Status	Will not start
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON41846

Source
ToetsingOnline

Brief title
Decreasing social jetlag by controlling blue light

Condition

- Other condition

Synonym
sleep deprivation and circadian misalignment

Health condition

sleep deprivation and social jetlag

Research involving

Human

Sponsors and support

Primary sponsor: Rijksuniversiteit Groningen
Source(s) of monetary or material Support: 2nd level funding by STW Perspectief 2010 program (project number P10-18)

Intervention

Keyword: blue light, melatonin, sleep, social jetlag

Outcome measures

Primary outcome

Sleep timing from sleep diaries (subjective) and rest/activity profiles from actimetry (objective) and endogenous circadian phase of melatonin from saliva samples; the start of the rhythm will be measured: dim light melatonin onset (DLMO). A shift in DLMO is interpreted as a shift in the endogenous circadian pacemaker.

Secondary outcome

Sleep quality from subjective sleep diaries, light exposure assessed from sleep diaries (subjective) and from actimetry (objective).

Study description

Background summary

Many physiological processes are rhythmic and differ between people, for example our sleep-wake times or daily levels of alertness. An internal biological clock regulates these rhythms and the daily light/dark cycle is essential for ensuring that our body clock is synchronised to the 24-hour day. However, 75% of the population must use an alarm clock to awaken on workdays. By definition these people are chronically sleep deprived. From controlled laboratory studies, there is ample evidence showing the detrimental effects of sleep deprivation on health and performance, with consequences that would be

catastrophic in real life - especially in e.g. shift-work occupations. This problem especially affects later chronotypes (people with a later phase of entrainment), which primarily show an increased risk of chronic sleep deprivation, a phenomenon that has also been coined social jetlag. Chronotype (e.g. *owls* vs. *larks*) is assessed via the Munich ChronoType Questionnaire based on calculating the mid-point of sleep on free days (MSF) and workdays (MSW), with the MSF being corrected for sleep deficit accumulated across the workweek (MSF sleep corrected, MSFsc). Social jetlag is quantified as the difference between MSF and MSW, and is a marker for chronic physiological stress resulting from a mismatch between social and environmental/biological time. Having social jetlag, thereby, simply infers that one lives in a given time zone but works *in* a time zone further east (comparable to jetlag from traveling but without the actual travelling). Studies of our workgroup have shown, that social jetlag is significantly positively associated with an increased risk of smoking, obesity, and heart rate (especially in shift-workers).
Because blue light is the main zeitgeber regulating the timing of sleep (via synchronisation of our internal clock), this major societal problem can be greatly improved with a better understanding of the variety of responses of the human biological clock to the timing and intensity of both light exposure and light avoidance. The published literature shows the potential of additional morning blue light exposure from blue-light emitting devices to advance sleep onset and also the circadian phase of melatonin significantly. In addition, recent studies strongly suggest that it is especially blue light in the evenings and primarily from TV*s, LED*s and computer/tablet screens that delay sleep timing, hence resulting in higher social jetlag. Two recent studies tested blue wavelength light blocking (reducing) glasses (worn from 3 hours before bedtime) and showed significant improvements in subjective sleep quality. These studies only tested small numbers of participants and only assessed subjective parameters, and argued in favour of future studies with larger sample sizes and objective parameters. However, no study compared the effect of (i) blue light reduction in the evenings compared to (ii) increased blue light exposure in the mornings in the same participants to decrease social jetlag. In the current study we, therefore, combine in a cross-over within-subject study the effect of controlled morning light exposure and controlled shielding from evening light tested in separate weeks on sleep timing, social jetlag and circadian phase of melatonin from saliva samples.

Study objective

To elucidate in the same participants (late chronotypes with at least two hours of social jetlag) the changes in sleep timing, social jetlag and endogenous circadian phase of melatonin with more than two hours of social jetlag shielded from blue light in the evenings compared with increased blue light exposure in the mornings.

Study design

Interventional field study; Applying a cross-over study design we will equip participants with short wavelength (blue) light reducing orange glasses (experimental condition 1) to be worn for at least three hours before sleep onset for seven days. The same participants will be equipped with blue-LED-light emitting glasses to be worn for two hours after wake up (experimental condition 2) for seven days. Effects will be measured by comparing each intervention period with a seven days baseline period.

Intervention

Short wavelength (blue) light reducing orange glasses (blue light absorption >93%; appendix D1b; experimental condition 1) for seven days for at least three hours before sleep time (lights out; when waking up during the night, e.g. to use the toilet, participants will be asked to put on the glasses before switching on the room lights), and blue-LED-light emitting glasses (www.enwake.me; comparable to the Philips goLITEblu devices; appendix D1c; experimental condition 2) for two hours after wake up. The order of experimental glasses 1 and 2 will be randomized.

Study burden and risks

There are no known or expected adverse events from participating in our study. The only intervention is to wear orange/amber glasses in the evening and to complete questionnaires. We do not apply any severe or acute sleep deprivation protocol. All participants will have at all days the possibility to sleep at home without interfering with their normal daily routines.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

Healthy men and women between 18 and 45 years of age
Social jetlag = difference between mid-sleep on workdays and days off of minimum 2 hours
Written informed consent

Exclusion criteria

• Sleep disorders, e.g. sleep apnoea, narcolepsy, restless legs, primary insomnia (will be asked in the General Questionnaire, appendix F1a)
• Mood disorder; because of the possibility of depressive mood as co-morbidity in late chronotypes we will exclude depressed participants
• Two or more time zones crossed 1 month before study participation
• Shift-work during 5 years prior to participation
• Recent eye surgery (last year), glaucoma or other eye disease
• History of chronic diseases, and/or use of chronic medication for 3 months or longer before study participation
• Alcohol/drug problems (based on answers to General Questionnaire, appendix F1a)
• The use of photosensitizing medication
• Wearing spectacles already (contact lenses allowed)
• Sleeping with open curtains in the bedroom
• Pregnancy; because sleep (one of our main outcome measurement) can be disturbed during pregnancy

Study design

Design

Study type:	Interventional
Intervention model:	Crossover
Allocation:	Randomized controlled trial
Masking:	Open (masking not used)
Control:	Active
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Will not start
Enrollment:	30
Type:	Anticipated

Ethics review

Approved WMO

Date:	23-04-2015
Application type:	First submission
Review commission:	METC Universitair Medisch Centrum Groningen (Groningen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL51499.042.14