

# LIGHT Feeling healthy, energized and fit.

Propeaq light therapy glasses operating principles and applications



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## Blue light and melatonin

The blue light from the Propeaq light glasses suppresses the production of melatonin. This hormone is produced at night by the pineal gland (epiphysis) and gives the body the signal that it needs to prepare for the night. During sleep, recovery of many body processes takes place and thus sleep is essential for cognitive and physical functioning and health in general. The rhythm of the secretion of melatonin is endogenous

controlled by the biological clock in the brain (Suprachiasmatic Nuclei, SCN) which in turn is controlled by clock genes and (day)light falling on the eye. The retina of the eye has special ganglion cells (intrinsically-photosensitive retinal ganglion cells ipRGCs) that, under the influence of the photo pigment melanopsin and light, control the SCN.

Bluish light (460-480 nm) has the most effect on suppressing the production of melatonin, even in a very low intensity. In addition to being a 'night hormone' melatonin is also a powerful antioxidant and is able to eliminate harmful free radicals.

The changeable red lenses in the Propeaq light glasses on the other hand do not suppress the production of melatonin. So by a well-timed use of the changeable light-blue lenses in combination with the bluish light and the red lenses (without the light), it is possible to shift the sleep-wake rhythm

to a later or earlier period. This does not affect the duration and quality of sleep. For a shift to a later time, light blue lenses with blue light (30 minutes) just before bedtime is followed by a sleep of at least 8 hours. This way the sleep-wake rhythm can be shifted at least 1,5 hours per day. For a shift to an earlier time one uses the light blue lenses with blue light (30 minutes) in the morning and the red lenses (with no light) in the evening. In this manner, an 1 hour shift per twenty-four hours can be achieved. In all cases it is important that a sleep of approximately 8 hours is achieved.

*Action spectrum for melatonin regulation in humans: evidence for a novel circadian photoreceptor. J. Neurosci., 21 (2001), pp 6405 – 6412*

*Phototransduction by retinal ganglion cells that set the circadian clock. Science, 295 (2002), pp 1070 - 1073*

*Melanopsin in the circadian timing system. J. Mol. Neurosci., 21 (2003), pp 73 - 89*

*Diurnal spectral sensitivity of the acute alerting effects of light. Sleep Volume 37, Issue 2, 1 February 2014, Pages 271-281*

*An action spectrum for melatonin suppression: evidence for a novel non-rod, non-cone photoreceptor system in humans. J. Physiol., 535 (2001), pp 261 - 267*

*Blue light improves cognitive performance. J Neural Transm (Vienna). 2007;114(4):457-60. Epub 2007 Jan 25.*

## Winter blues and the use of light

Mood problems during the autumn, winter and early spring are for many people an annual source of irritation and trouble. Many millions of people in Europe suffer to a greater or lesser extent from these problems. The severe form is called winter depression and occurs in about 6% of the adult population in Northern Europe. About 3-4 times that number of people have the milder variant, the winter blues. Winter

blues is not a severe medical condition but an annoying health issue and occurs in all walks of life. Race, skin color or social status play no role. Especially women aged 13 to 55 years have a greater susceptibility to the development of winter blues.

An effective method that offers a solution for most people with

winter blues is light therapy with Propeaq light glasses.

### How to use Propeaq for winter blues

Light therapy is used for seasonal mood problems since the early Eighties of the past century. First, lightboxes were used which are effective but not very practical. Compliance is often very low because people are not willing to sit in front of a lightbox for a long time and for many days in a row. Here Propeaq has a real advantage because the user is free to move and able to follow normal daily routines. The method is safe, effective and easy to endure. For winter blues, a 5 to 10 days cure consisting of a daily 30 minutes session with blue light



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and transparent (light blue) lenses after awakening is sufficient. The effect increases when using red lenses (and no light) in the same 5 to 10 days period, 30 minutes prior to sleep. If problems occur again, the cure can easily be repeated.

*Winterdepressie en lichttherapie I: syndroom en behandeling. Tijdschrift voor Psychiatrie 40 (1998) 5*

*Winterdepressie en lichttherapie II: prevalentie, etiologie, pathogenese en Werkingsmechanisme. Tijdschrift voor Psychiatrie 40 (1998) 5*

*Light therapy for seasonal affective disorder with narrow-band light emitting diodes (LEDs). Biol Psychiatry. 2006 Mar 15;59(6):502-7.*

*Low-intensity blue-enriched white light (750 lux) and standard bright light (10,000 lux) are equally effective in treating SAD. A randomized controlled study. BMC Psychiatry. 2011 Jan 28;11:17.*

*The efficacy of light therapy in the treatment of mood disorders: a review and meta-analysis of the evidence. Am J Psychiatry. 2005 Apr;162:656-662.*

### Sleep-wake disorders and synchronizing the body clock

Delayed sleep phase disorder (DSPD), also known as sleep rhythm disorder, is a chronic disorder in which the alarm clock of the body, the biological clock, is not synchronized with the morning-rise /evening-sleep pattern of the majority of adults and adolescents. Experts think the disorder is caused simply by a different clock setting or by a decreased response to the energizing power of light. Patients with DSPD fall asleep very late and have trouble

getting up in the morning. Often patients report that, regardless of the time of going to bed, every night they fall asleep around the same time but not until early dawn. This way they get into trouble (sleep debt) if they have to perform according to the prevailing 9-5 scheme (a regular school- or workday). If those patients would be able to hold on to their own sleep schedule, and don't have another disorder such as sleep apnoea, they sleep well. They wake up by

themselves after their normal need for sleep only after different sleep hours.

### **How to use Propeaq for sleep-wake problems**

The treatment of DSPD is quite specific. It requires a different approach to the treatment of insomnia.

Starting point of a successful treatment is that the patient is able to exactly follow the time-scheme (discipline) and that the patient can sleep his needed sleep hours.

- Light and medium DSPD cases can be treated by having the patient go to sleep 15 minutes earlier each day until the desired bedtime is reached. In the morning the patient takes light therapy with Propeaq light glasses for 30 minutes, for example during breakfast. If the patient usually gets up late he now gets up 15 minutes earlier every day, followed by 30 minutes of light therapy.
- The patient should avoid light after 20.00 h generally, then wear the Propeaq light glasses with the red lenses. No screens (PC, laptop, tablet, smartphone) after 22:00 h.
- Before starting treatment, the patient is asked to sleeping regularly the week before, without napping, at times that feel good for the patient. It is important that the patient is healthy prior to the treatment.
- If the patient has reached an earlier sleep schedule, he needs to adhere this schedule very strictly. DSPD patients are advised not to go to bed before they are actually tired and to not consume alcohol and caffeine after 20.00 h.
- Patients are advised to use a sleep diary
- The patient should adjust his/her lifestyle. Late chronotypes "owls" are often active (and creative) in the evening and night. It is advisable to shift this behaviour slowly to an earlier time if DSPD implies a reduction of the quality of life.

In all cases use the blue light in combination with the transparent (light blue) lenses only.

*Treatment of Circadian Rhythm Sleep Disorders with Light. Ann Acad Med Singapore 2008;37:669-76.*

*Cognitive Behavioral Therapy as an Adjunct Treatment to Light Therapy for Delayed Sleep Phase Disorder in Young Adults: A Randomized Controlled Feasibility Study. Behav Sleep Med. 2015 Aug 5:1-21.*

*The effects of light therapy on sleep problems: A systematic review and meta-analysis. Sleep Med Rev. 2015 Sep 9;29:52-62.*

### **Preventing jet lag**

Jet lag is the disruption of the sleep - wake rhythm that occurs when a person travels, in a relatively short time, to a place on earth where the local time differs significantly with the local time of the place of

departure. Jet lag (or time lag) is usually more annoying when traveling east than west.

The jet lag symptoms are:

- reduced performance
- fatigue that can last five days
- mild degree of disorientation
- dehydration
- digestive problems
- decreased energy and concentration
- trouble sleeping
- the feeling of having a cold
- stress, depression

Because of these symptoms jet lag has a direct effect on the performance of athletes, frequent flyers, businessmen and all other travellers. The reaction rate and alertness decreases significantly. More troublesome however is that jet lag results in a disruption of the sleep-wake rhythm that is regulated by the biological clock in the brain. This disruption can last from days up to two weeks.

### **How to use Propeaq to prevent jet lag and the use of the Propeaq app**

When traveling to the West, the Propeaq light glasses are used, with the blue light and light blue lenses for 30 minutes in the late evening, and the red lenses in the morning in case the user had less than eight hours of sleep. The method starts several

days prior to the flight, and every night about 1 hour later applied. When traveling to the east the method works vice versa: the blue light with light blue lenses for 30 minutes each morning, every day one hour earlier, followed by going to sleep every night one hour earlier. In case of being unable to sleep in the early evening, the red lenses in the Propeaq light glasses can be used to stimulate the production of melatonin which helps you sleep.

For a complete step by step schedule, use the special anti-jet lag app developed by Propeaq. The Propeaq app can be downloaded from the App Store or Google Play.

A quick fix for some of the symptoms can also be achieved.

- When flying to the west; use the blue light for 30 minutes at the end of the afternoon when feeling tired after arrival. When awakening to early on the first night at your destination, use the red lenses to extend the night.
- When flying to the east; use the red lenses for blocking (day)light the first one or two hours after arrival. After that, the blue light can be used to seek extra light.

*How To Travel the World Without Jet lag. Sleep Med Clin. 2009 Jun 1; 4(2): 241–255.*

*How to trick mother nature into letting you fly around or stay up all night. J Biol Rhythms. 2005 Aug;20(4):353-65.*

*The effects of chronotype, sleep schedule and light/dark pattern exposures on circadian phase. Sleep Med. 2014 Dec;15(12):1554-64*

## Shift work and changing the sleep-wake cycle

Work that is done in (night) shifts takes place at times that one naturally should sleep. The short-term health problems as a result of shift-/night work are a decreased concentration and alertness, fatigue and sleep problems during the day. The long term effects are more serious. People who work in (night) shifts for a long time frequently suffer from disruptions of the metabolism that can result in diseases like obesity and type II diabetes, but also in some cancers and cardiovascular disease. Because employees are often tired during nightshifts, this can lead to risky situations due to reduced alertness and concentration. Like in cases of jet lag, the Propeaq light glasses can help people working in (night)

shifts to change the sleep-wake rhythm to a (mostly) later moment.

### How to use Propeaq in shift work situations

Propeaq is an ideal solution for beating fatigue during evening- and night shifts. In the day shift, one can use 20 minutes of blue light at the moment of feeling sleepy as an alternative for a powernap. In the evening shift, one can use the blue light in the second half of the shift for 30 minutes. In the night shift, one can use the blue light for 30 minutes between 01.00 h and 03.00 h, for example during a break. Use the blue light only in combination with the transparent (light blue) lenses.

*The effectiveness of light/dark exposure to treat insomnia in female nurses undertaking shift work during the evening/night shift. J Clin Sleep Med. 2013 Jul 15;9(7):641-6.*

*Human responses to bright light of different durations. J Physiol. 2012 Jul 1;590(Pt 13):3103-12.*

*How to trick mother nature into letting you fly around or stay up all night. J Biol Rhythms. 2005 Aug;20(4):353-65.*

*The effect of light on the human circadian pacemaker. Ciba Found Symp. 1995;183:254-90.*