Light Therapy for Circadian Rhythm Disorders

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We live in a 24-hour world but our biological clock is about 24 hours and 10 minutes. A person with Delayed Sleep Phase Syndrome may have a biological clock that is 24 hours and 15 minutes or longer. Imagine living on the West Coast and having a watch that was 15 minutes slow every day. In 12 days, it would be on "Hawaiian time" or about 3 hours late.

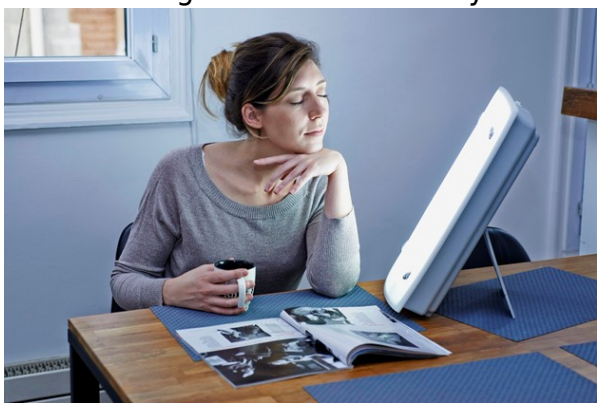
What resets our biological clock is bright light first thing in the morning. The light travels from our eyes through a special optic tract to the superchiasmic nucleus at the base of the brain right above the pineal gland. This light signal essentially resets your biological clock so that about 14 hours later the pineal gland is triggered to release melatonin that helps your body become biologically ready for sleep about 2 hours after that.

However, if you sleep in and do not get that light in your eyes within an hour of your normal wake time, your clock will drift that 10 – 15 minutes. This results in your body becoming biologically ready for sleep 10 – 15 minutes later than normal. Over a weekend, a winter break or summer holiday, the biological clock delays 10 – 15 minutes each day resulting in wanting to go to sleep later and get up later each day. Then, when it is time go back to school or work, it is hard to fall asleep at your earlier regular bedtime. This may result in insomnia. It is also much harder to get up at your regular time which now feels too early.

Exposing your eyes to bring light can be used to intentionally shift your biological clock. Under ideal circumstances, the average person can shift their biological clock and their ability to fall asleep about 1 hour per day if you are trying to go to sleep earlier. You may be able to shift up to 90 minutes per day if you are going to bed later. However, this can vary from person to person.

Your eyes are fairly sensitive to light. Even dim light, especially in the blue spectrum, can affect the biological clock. The effect is much stronger when the light is bright. Even on cloudy days, daylight without sunglasses is the best. When sunlight is not available, then a bright light device, such as that used for Seasonal Affective Disorder (SAD), is quite effective. The recommended dose for UV filtered white fluorescent light is 10,000 Lux for

about 30 to 45 minutes at an oblique angle to your vision, not necessarily looking directly at it. For maintaining the biological clock in the right “time zone”, the best effect is when it is used starting within the hour of your normal wake time.



Older light box units were up to 4 feet wide. Current units are much smaller in the form of a box or desk lamp. There are even smaller portable flat panels and visors worn on the head. The strength of the light varies with the distance squared. If you double the distance from the light, the strength drops to one-quarter. Except for the light visor, most units are designed to give 10,000 lux when viewed from 10 to 20 inches away depending on manufacturers recommendations. If you double the recommended distance you will have to quadruple the time spent in front of the light to get a similar effect.

Light in the blue spectrum seems to have the greatest effect on the biological clock even when it is less bright. Some newer units use blue LED lights which are small and portable. One concern about blue light is that it is close to the UV spectrum which is harmful to the eyes and has to be carefully filtered.

Contraindications and Side Effects for Light Therapy

Although light therapy is generally quite safe, there are some contraindications and potential side effects. It is recommended that new light therapy users have an eye exam before starting therapy to confirm normal eye health. Light therapy is absolutely contraindicated in patients with retinopathy. Those with glaucoma, cataracts or other eye disease should check with their ophthalmologist before starting light therapy.

There are many common drugs that can sensitize the skin and retina to the effects of light. These include Tetracycline, Benadryl, St. John’s Wort, and certain drugs for psoriasis, acne and other skin diseases, and certain antipsychotics, antidepressants, antiarrhythmics, diuretics, chemotherapeutics, anti-diabetics, sulphonamides, and antimalarials. If you are on any medications, you should talk to your dermatologist or pharmacist to make sure you are not taking any photosensitizing drugs that could damage your skin or eyes with light therapy.

Light therapy is used for SAD and can occasionally trigger hypomania in patients with depression or bipolar disorder. These patients should be monitored closely for changes in mood or behavior.

Light therapy may also cause eye strain, soreness, or headaches. Thus, it is recommended that you start with 20 minutes of light exposure and work up from there to determine your tolerance.

Delayed Sleep Phase Syndrome

If your biological clock is only delayed 3 or 4 hours, the quickest way to return things to normal might be just to get up at the required time and make sure you get 30 – 45 minutes of bright light each morning. Don't immediately try to go to bed earlier yet. Go to bed at your usual later time when you are typically able to fall asleep. As your biological clock advances you should be able to fall asleep 30 to 60 minutes earlier each night until you are getting enough sleep to feel rested. Initially you will be sleep deprived. That extra sleepiness will make it easier for you to fall asleep at night and overcome the insomnia.

A gentler way to change your biological clock is to determine what is the earliest time you can be reasonably successful at getting up. Get up with the alarm and get 30 – 45 minutes of bright light (preferably outside) starting within 30 minutes of rising. Go to bed no earlier than 8 hours before your rise time. After one to three days of success at falling asleep within 30 minutes of bedtime, you can advance the alarm 30 minutes. Then that night you can go to bed 30 minutes earlier. Do not try to go to bed earlier first. Your biological clock needs the earlier light in the morning first to advance your clock. You then advance the morning alarm 30 minutes followed by the bedtime every 1 – 3 days until you are sleeping in the right "time zone". Maintain that time zone by not allowing yourself to sleep in later than one hour on days off. Use morning bright light on awakening as needed to reinforce the biological clock and the ability to feel sleepy by bedtime.

Advanced Sleep Phase Syndrome

Bright white light in the evening for 30 to 120 minutes starting about 2 hours before the preferred bedtime can be effective in delaying the biological clock. It is important to set an alarm for 7 to 8 hours later. Even if you cannot sleep, you do not want to expose your eyes to any light until the alarm to prevent the biological clock from advancing again. Ideally sunglasses or blue light blockers should be worn for a few hours after that if you are going outside after sun-rise.

Shift Work Sleep Disorder

Workers with a tendency to a delayed sleep phase seem to tolerate shift work better. Bright light consisting of 5000 lux for 4 hours or 3000 lux for 6 hours starting in the evening of the night shift followed by wearing sunglasses on the way home from work to induce a delayed sleep phase, generally seems to work the best. Because most shift work involves rapidly rotating schedules, it is not appropriate to try to completely change the biological clock with each shift change. It is best just to remain with a delayed sleep phase. This seems to allow the worker to maintain a basic good sleep during the night when they are working during the day. However, they tolerate working at night better and are still be able to sleep reasonably well during the day after a night shift.

Jet Lag Disorder

Travelling north or south does not cross time zones. However, if you cross three or more time zones travelling east or west, you may have some trouble falling asleep and waking up at your regular time in your new time zone when you travel east. Traveling west you are

more likely to find it hard to stay awake until your usual bedtime and then be awake early in the morning.

Travelling east, you can generally shift your sleep time about one hour or one time zone per day. Your biological clock may not actually shift that much but you should be able to go to sleep up to about an hour earlier per day under the right circumstances. Travelling west it may be possible to shift your sleep at the rate of up to 90 minutes per day. Although again your biological clock may not quite keep up.

Generally, travelling east less than 12 time zones, it is a good idea to start advancing your bedtime one hour per day starting 3 days before your trip. You will be more successful if you first get up an hour earlier, get bright light for 30 – 45 minutes to reset the biological clock, and then go to bed an hour earlier that night. Repeat for the next 2 days. On your travel day you will be up another hour earlier to shift your clock again but bedtime may depend on how long your trip is and whether you have the opportunity to sleep at bed time. When you get to your destination try to continue to advance your rise time and bedtime an hour per day in relationship to your home clock until you are in sleeping at the time you want in your new time zone.

Travelling west you will delay your sleep time by going to bed 60 – 90 minutes later per night and getting up 60 – 90 minutes later. Delaying your biological clock is usually easier. Bright light in the 3000 to 5000 lux range for 2 to 4 hours prior to bed time and avoiding bright light for the first 2 hours in the morning is helpful.

If you are travelling more than 12 times zones in one direction you should consider moving your biological clock in the other direction if practical. If you are going to be away for less time than it will take to change your biological clock to the new time zone, then you might be better to not change your biological clock and just try to manage your reduced nighttime sleep with naps during the day.