

# The Use of Bright Light in the Treatment of Insomnia

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## PROTOCOL NAME

The use of bright light in the treatment of insomnia.

## GROSS INDICATION

Certain types of insomnia that are associated with abnormal timing of circadian rhythms may be treated with bright light therapy.

## SPECIFIC INDICATION

Some individuals with sleep onset insomnia experience difficulty falling asleep at a “normal time” but no difficulty maintaining sleep once it is initiated. Individuals with this type of insomnia may have a delayed or later timed circadian rhythm. Bright light therapy timed in the morning after arising can advance or time circadian rhythms earlier and thus would be indicated for sleep onset or initial insomnia. Morning bright light therapy is also indicated for the related problem of delayed sleep phase disorder.

Individuals experiencing early morning awakening insomnia have no difficulty initiating sleep but their predominant difficulty is waking before intended and not being able to resume sleep. These individuals may have an advanced or early timed circadian rhythm. Bright light therapy in the evening before sleep would be indicated for this type of insomnia as well as for the more extreme version, advanced sleep phase disorder.

## CONTRAINDICATIONS

Bright light therapy would not be recommended in the following cases:

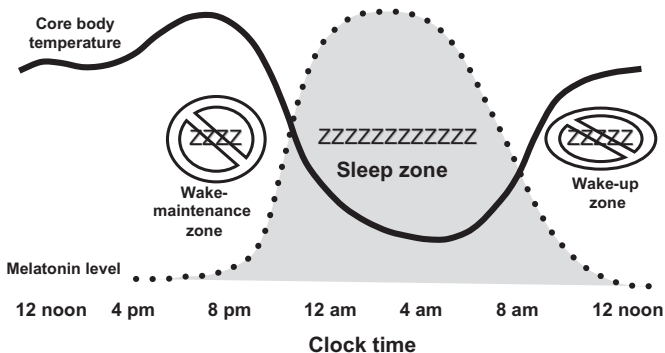
- Insomnia in which there is no indication of abnormal timing of circadian rhythms (e.g. combined problem initiating and maintaining sleep, having no strong morning or evening activity preferences)

- Individuals with eye problems such as cataracts
- Individuals who have a light sensitivity due to medical/medication reasons

## RATIONALE FOR INTERVENTION

Circadian rhythms exert a very strong effect on our subjective and objective sleepiness, that is, how sleepy we feel, how quickly we will fall asleep, and the time we wake. In a person with a normally timed circadian rhythm the sleep period occurs between about 11 p.m. and 7 a.m. Maximum circadian sleepiness occurs between 1 a.m. to 6 a.m., associated with decreased core body temperature and high melatonin levels (Figure e39.1). Wake-up time usually occurs soon after the body temperature begins to rise, that is, about 7 a.m. Figure e39.1 also shows that there are two circadian periods that surround the sleep conducive zone during which sleep may be inhibited: the “wake maintenance zone”, in normal sleepers occurs between 6–10 p.m. and a less intense and longer “wake-up zone” which occurs between 8 a.m. and noon.

Disturbances of the relationship between the circadian rhythm and the preferred sleep-wake pattern can lead to chronic sleeping difficulties. If individuals have a delayed (later timed) circadian rhythm their evening wake maintenance zone may be delayed until 1 a.m. If they try to sleep at 11 p.m. sleep onset would be delayed. If the individual has to wake in the morning for social or work obligations at their usual time (e.g. 7 a.m.) then total sleep time would be reduced. This can develop into chronic sleep onset insomnia. Several nights of reduced sleep will result in daytime impairment and distress.



**FIGURE e39.1** This illustrates the circadian rhythms of core body temperature and melatonin for a good sleeper normally sleeping between 11 p.m. and 7 a.m. This produces a circadian sleepy zone during that sleep period but is bracketed by two alert zones; a wake maintenance zone from about 6–9 p.m. and a wake-up zone from about 8 a.m. to 12 noon. If the circadian system becomes delayed in time, the wake maintenance zone will be delayed and can inhibit sleep onset and lead to sleep onset insomnia. If the circadian system becomes advanced (timed earlier), the wake-up zone will be advanced and can lead to early morning awakening insomnia.

Conversely, some individuals may have an early timed or phase advanced circadian rhythm that would result in their “wake-up zone” occurring as early as 3 a.m., thus curtailing sleep earlier than desired. This too can lead to a reduced total sleep time and daytime impairment and the development of chronic morning awakening insomnia.

Studies over the past 20 years have shown that appropriately timed bright light can change the timing of the circadian rhythm. For example, morning bright light will change the phase of the circadian rhythm to an earlier time. Therefore this could be a suitable therapy for those individuals with sleep onset insomnia who are having difficulty falling asleep until quite late (e.g. midnight or later). With an earlier timed circadian rhythm, they may be able to fall asleep and wake earlier following a regime of morning light therapy.

Bright light administered in the evening has been shown to delay the circadian rhythm. Therefore, using a regime of evening bright light therapy, individuals experiencing early morning awakening insomnia may be able to delay their sleep/wake cycle resulting in a later wake up time. Overall total sleep time would increase and daytime functioning would improve.

## STEP-BY-STEP DESCRIPTION OF PROCEDURES (HOW TO)

Bright light therapy can be administered using outdoor sunlight or artificial bright indoor lighting. Normal indoor lighting (about 100 lux) is of insufficient intensity. Research has demonstrated that light of about 1,000 lux or more is efficacious at phase changing the circadian rhythm. More recent research has also shown that it is the shorter wavelength blue light that is the most effective wavelength in changing the timing of the circadian rhythm. There are many commercial light devices available. To be effective, light needs to enter the eyes, however staring at the light source is not necessary and with some devices is **NOT RECOMMENDED**. Clients may eat a meal, watch television, read, work on a computer or do other activities while receiving the light stimulus in their visual field.

### Pre Therapy

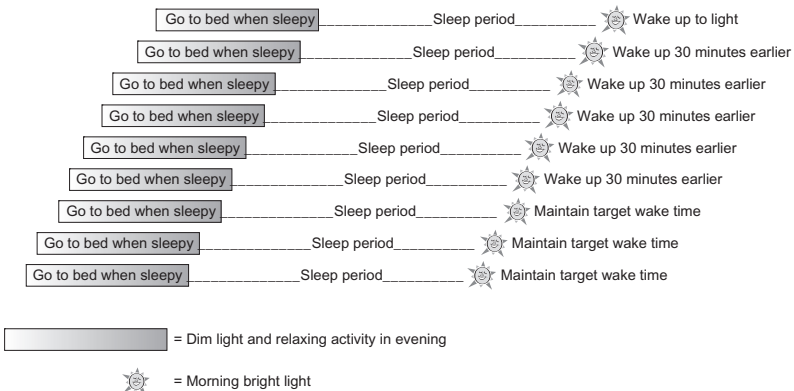
Clients with insomnia are asked to complete a one or two week diary that documents their bedtimes, lights out and estimated sleep onset times, timing and lengths of any night time awakenings and final wake up time. Total sleep time and total time in bed can be calculated from this information. Food, caffeine and alcohol intake should also be recorded. It is necessary to determine the client’s actual sleep/wake schedule taking into account their work/school/social commitments rather than to rely upon a rough verbal estimate of their normal sleep.

The client’s preferred or target sleep period should be determined realistically taking into account their work/social commitments and motivation for change.

The ideal protocol would be:

### *Sleep Onset Insomnia*

1. The first step is to evaluate the timing of the client's circadian rhythm and sleep/wake pattern when the choice of sleep period is self-selected and without any interference of commitments. For two consecutive nights ask the client to go to bed when feeling sleepy and note the sleep onset and spontaneous wake up time. This will give you an indication of their endogenous (internal) circadian phase.
2. Start the first light therapy session from this spontaneous wake up time.
3. Wake up time and bright light exposure is then advanced 30 minutes each morning until preferred wake up time is reached (See Figure e39.2). This regime is flexible, for example, a client may wish to commence with smaller (15 minute) advances or may wish to stay at a particular wake up time for 2 to 3 days before continuing with the advancing of wake up time. This can occur if the client is finding the protocol difficult. It can take between 7 to 14 days to reach the desired sleep schedule. It is recommended to continue for another week of morning bright light therapy after the desired sleep schedule has been reached.
4. Although outdoor morning light is ideal, an artificial light device may be needed during darker or inclement months. The client should receive the visual light stimulation immediately on awakening and for up to an hour if possible.
5. It is recommended that clients do not wear very dark or blue blocking sunglasses in the mornings.



**FIGURE e39.2** Illustrated is the use of morning bright light treatment and stimulus control therapy for sleep onset insomnia. In this case wake up time needed to be advanced by 2.5 hours over five mornings resulting in a more gradual advance of sleep onset time.

6. Sleeping-in later than the scheduled time should be avoided. It can delay the circadian rhythms and cause a relapse. That is, maintain a consistent wake up time, even on weekends.
7. In the hour or two before bedtime dim light and a relaxing activity is recommended, i.e. no computer work.
8. Stimulus control therapy instructions should be followed before bedtime to ensure the client is not lying in bed awake for long periods.

### *Early Morning Awakening Insomnia*

1. Clients are asked to keep active in the evening and to stay in bright ambient light. For example, they are encouraged to eat dinner, do any housework, watch TV or other activities in a well lit room, preferably under fluorescent lighting. It is recommended that clients be exposed to evening bright light until as late as possible. An ideal regime would be for the client to stay up and be exposed to bright light until about midnight on two consecutive evenings and then until their target bedtime for a further 5 to 7 days. It is usually necessary to use an artificial light source at this time of night to provide sufficient intensity of light. Again, clients can sit in front of the light device while watching TV, reading, or working on a computer.
2. It is recommended that clients avoid bright light in the mornings and may need to wear dark glasses or blue light blocking glasses if they wish to go outside in the first hours after awakening. Blue blocking glasses will have a red or “smokey” tinge and reduce transmission of blue light.
3. If clients are experiencing night time awakenings, then bedtime restriction therapy may also be recommended with evening bright light exposure until their new bedtime as part of the reduced bed period treatment.

## **POSSIBLE MODIFICATIONS/VARIANTS**

Clients with an advanced circadian rhythm may not be able to tolerate staying up past their usual bedtime. In this case, the evening light therapy regime may be carried out over a longer time period (e.g. 2 to weeks).

## **PROOF OF CONCEPT/SUPPORTING DATA/EVIDENCE BASE**

Considerable evidence has linked circadian rhythm phases to wake maintenance and wake up zones which inhibit sleep [1–3].

There is increasing evidence that individuals with sleep onset insomnia may have a delayed circadian rhythm [4–6] and, conversely, those with early morning awakening insomnia have an advanced rhythm [7–9].

Appropriately timed bright light will re-time the circadian rhythm [10,11]. Morning bright light has been shown to advance the circadian rhythm of subjects with sleep onset insomnia [12] and delayed sleep phase disorder [4,13]. Evening

bright light has been shown to effectively delay the circadian rhythm and sleep/wake pattern of those with early morning awakening insomnia [9,14,15].

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## RECOMMENDED READINGS

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