Sleep disturbances by light at night: two queries made in 2003 in Czechia

Martin Forejt[1], Jan Hollan[2], K. Skočovský[3] and R. Skotnica[4].)

[1]Masaryk University in Brno, Med. Fac., Dept. of Preventive Medicine;
[2]N. Copernicus and Planetarium in Brno, Kraví hora 2, 616 00 Brno, tel. +420 541 321 287, hollan(at)ped.muni.cz, `www.astro.cz/darksky`;
[3]Masaryk University in Brno, Fac. of Soc. Stud., Centre for Reseach of Development of Personality and Ethnicity;
[4]Focus Agency, `www.focus-agency.cz`

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A short grant by the **Czech Environment Ministry** (VaV/740/3/03) in autumn 2003 started scotobiology research by our group based in Brno. The present poster stems from its final report, Hollan *(ed)* 2004.

Many people live in streets where windows are more illuminated than the road

1 How many people suffer from intruding artificial light

The introductory sample had three hundred respondents. The subsequent main query included one thousand people over 15 years, country-wide. This is fully representative for the Czech population. Results:

- **5 % of Czech population perceives unwanted artificial light from outdoors as one of the two main causes of their sleep problems,**
- further 7 % complains about light amounts which are not attenuated to tolerable levels,
- further 20 % attenuates light pollution of their bedrooms to dark levels perceived as sufficient,
- 5 % of Czech population is however unhappy to miss the full natural morning light due to barriers against light-at-night they have to use.

We should ask, what are the health consequences of reduced morning light for the remaining 20 % of population which uses barriers against light at night and does not complain about it?

Too much light is commonly associated with towns and cities. However, no dependence of imissions to bedrooms on the size of settlement has been found.

Stationary outdoor lighting has been reported as by far the most significant source, ordinary street lighting at the first place. Automotive headlights have been mentioned as a problem by just a quarter of respondents which were disturbed by intrusion of light at night.

People disturbed by artificial light during their sleep often mention they are sleepy in the morning (one half of such respondents).

One third of Czech population perceives to be disturbed by full Moon in their bedrooms. Moon does not give much light, maximum illuminance of a vertical window is not over 0.2 lx, half of that is typical – we can infer that **0.1 lx of white light at the window plane is surely a nuisance** for people wanting to sleep.

Anecdotal evidence shows much lower values of indoor illuminance are perceived as disturbing by some individuals, 0.01 lx or several millilux only, at the plane of their eyes.

Conclusions

Artificial lighting intruding from outdoors disturbs one third of the population.

This makes it a serious health problem regardless of its possible oncogenic consequeces. A problem that should be diminished by technical and organizational measures as quickly as possible. In any case, it should be completely avoided for future outdoor lighting installations by using luminaires with no direct emissions toward the windows and with dimming (or switching) possibilities for late night time. People have “right to night”. Night used to be a period

characterised by absence of more light than starlight and occasionally moonlight. Not only silence is needed for health and comfort, darkness may be even more important. True night should be brought back again.

To avoid sleep disturbances, light levels should kept so low that the **face illuminance is below one millilux**. This is the outdoor level during natural moonless clear nights. The level people adapted to during their evolution. (A simple way of measuring illumination down to a fraction of millilux level is using a common solar cell. A separate poster deals with this, Posch *et al.* 2004.)

A detailed book dealing with *the need of darkness and plenty of sleep*, during the winter half year (apart from discussing food, excercise, obesity etc.) is Wiley and Formby, 2001.

Topics for further research

Blood pressure has been suggested as a quantity, which could be influenced by light at night. Confirmation of this and possible consequences are presented at a separate poster (Siegelová *et al.* 2004). More data should be obtained, with documented light levels (photopic, scotopic, and "metabolic" ones).

Levels of light perceived as disturbing should be found for different types of light sources (orange high pressure sodium, greenish mercury, yellow low pressure sodium, various white discharge sources). Are the sources with little or no blue-green component less disturbing?

Cancer patients might be asked about light in their bedrooms in the past times. In some cases we can measure the light levels. For young children, the option of lighting their bedrooms should be registered. Is there a difference from the healthy population?

Oncologic registers may be used to search for seasonal trends – are there more cancers found after the summer with its less natural darkness (and possibly lower melatonin levels)?

An example of such a variation has been presented recently in London – the incidende of acute lymphoblastic leukaemia is greater for children born in winter: this could be caused by exposure of mothers to more light during critical months of pregnancy (Phillips and Phillips 2004).

References

Hollan J (ed), 2004: *Mapping of light pollution and negative influences of artificial lighting on living nature at the territory of Czech Republic.* Research report, available as `http://amper.ped.muni.cz/noc` (in Czech; some posters based on it are in the subdirectory *english*).

Siegelová J, Fišer B, Brázdová Z, Forejt M, Hollan J, 2004: *Disturbance of circadian processes by lack of dark: first results of blood-pressure monitoring*, poster at Cancer and Rhythm, Graz.

Posch T, Kerschbaum F, Hollan J, 2004: *Measuring pollution by light*, poster at Cancer and Rhythm, Graz.

Phillips A, Phillips J, 2004: *Seasonal variation in month of birth of children diagnosed with acute lymphoblastic leukaemia and a possible relationship with light-at-night.* Poster at Childhood Leukaemia, London.

Wiley T S, Formby B, 2000: *Lights out: sleep, sugar and survival.* New York, NY: Pocket Books (Simon and Schuster).

*All these luminaires have the **vital property**:*
*they send **no light upwards and horizontally**.*
Direct illumination of windows can be easily avoided
(courtesy Cielobuio, Italy).