



MEDICAL ASPECTS OF LIGHTING: A STUDY OF PSYCHOLOGICAL AND PHYSIOLOGICAL RESPONSES TO LIGHTING DESIGN.

Monica Säter

*Head of Lighting Design Department, Jonköping University,
Jonköping, Sweden*

A study was conducted at Jönköping University in 2008 to investigate how a group of 20 people would be affected by spending an entire day in a total of three different lighting environments.

For the purposes of the study, three different lighting environments were designed for three identical rooms. Room 1 was designed with only natural light as the source of light. Room 2 was equipped only with artificial lighting which was designed to imitate natural light. Room 3 was equipped only with artificial lighting which was designed to deviate from natural light. Test subjects spent one day in each room. They had a balanced order of presentation, were their own control group and carried out the same activities in the three rooms. Estimated emotional perceptions and performance were measured through psychological instruments. Physiological response was measured through hormonal tests for cortisol, adrenalin, noradrenalin, melatonin and oxytocin.

Natural light is the light which has compared to artificial light, the highest quality with regards to number of wavelengths in electromagnetic radiation, photon quantity and variation in light. In this study, it is compared with a totally artificial light.

The study showed that at all times during the study, Room 1, the natural light room, received the highest mean rating for positive descriptive words and the lowest mean rating for negative descriptive words.

Room 3, the room which was designed to deviate from natural light, received the lowest mean rating for positive descriptive words and the highest mean rating for negative descriptive words.

The test subjects' emotional perceptions were supported by the evaluation of their hormonal responses. The results illustrated that future light sources should resemble natural light in terms of radiation quality, lighting levels and lighting variation and should only be used as a complement to natural light.

This study of just 20 people illustrated that the lighting designer's choice of radiation quality, lighting levels and lighting variation during the day were immediately felt by the room's user.

The study illustrates the need to investigate the same issue from the perspective of test subjects who are representative of the public.

The light-colour-space interaction influences humans, both psychologically and physiologically, 24 hours a day, throughout the entire year.

The establishment of a scientific basis for the design of such interaction requires widespread studies that make use of normal frequency distribution curves not only for physiological and hormonal responses, but also for psychological, ergonomic and visual responses. The cost of studying humans' need for light is so high that it cannot be covered within a single thesis research.



The study may reveal public health issues that are related to the use of artificial lighting. Such issues can and ought to be addressed and may be used to illustrate the importance of high-quality artificial lighting to users, particularly in countries that are situated far from the equator.

Without a scientifically established basis for the design of lighting that is representative of the public's needs, we lack the tools with which to create the high-quality lighting of the future. Such lighting is necessary if we are to better cope with spending the greater portion of our waking hours indoors.