Adjunct Proceedings

EXPERIENCING LIGHT 2009
International Conference on the Effects of Light on Wellbeing


Extended abstracts of interactive posters
Eindhoven University of Technology,
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EXPERIENCING LIGHT 2009 is an international conference on the effects of light on wellbeing. It was organized for the first time on 26-27 October 2009 and hosted by Eindhoven University of Technology. The program featured a large number of presentations, both oral and in interactive poster format, on new research and findings, new conceptualizations and designs, and new reflections on light and its psychological impact.

These adjunct proceedings contain the accepted extended abstracts of the presented posters. They were selected from the large collection of submitted papers through a carefully conducted review process, using blind peer-review. We are greatly indebted to the members of the Program Committee for their excellent work in reviewing the submitted papers and selecting the best papers and posters for presentation at the conference. We thank our sponsors for making this event possible, and all those who helped make EXPERIENCING LIGHT 2009 a success.

October 2009,
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Experiencing Light for Jet Lag Reduction during Long Haul Air Travel

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ABSTRACT
Jet lag is a common symptom for long haul flight travelers, nowadays different solutions exists in order to combat these symptoms. Those solutions mainly focus on changing the eating habits or light therapy before and after the flight for example. In this paper we describe the idea of creating lighting in the cabin in order to reduce the jet lag symptoms already during the flight, so providing the correct lighting and darkness conditions to prepare the body of the passenger to the destination conditions.

Keywords
Jet lag, aircraft cabin, lighting, light therapy and dawn simulation.

INTRODUCTION
It is well known that the amount of people that uses air travel as a method of transportation is increasing every year. Most of the aircraft passengers suffer physical and psychological discomfort due to the combination of several reasons such as limited space, long flight duration and unusual cabin environment in terms of air pressure, humidity and noise. One of the most common symptoms for long distance travelers is the Jet Lag, which is the desynchronization of the rhythm of an individual’s internal biological clock and the rhythm of the outside world [2, 8]. The most important symptoms associated with jet lag are fatigue, sleep problems and sleepiness during the day [1]. Internal clocks control a lot of bodily functions (temperature, heart rate, hormone production, sleep, mood, performance, etc.), which vary according to individual circadian cycles (daily cycles). The internal clock is controlled by external stimuli called zeitgebers [2, 4, 9]. The most significant zeitgebers are light, social relationships and the knowledge of the time. Therefore after a quick trip across multiple time zones, the zeitgebers in the new time zone will be sending conflicting signals to the internal biological clock, resulting in the appearance of the symptoms described above.

INTERNAL BIOLOGICAL CLOCK
The internal biological clock called the suprachiasmatic nucleus (SCN), is actually a pair of pinhead-sized brain structures that together contain about 20,000 neurons. The SCN rests in a part of the brain called the hypothalamus, just above the point where the optic nerves cross [9]. Light that reaches photoreceptors in the retina (a tissue at the back of the eye) creates signals that travel along the optic nerve to the SCN. Signals from the SCN travel to several brain regions, including the pineal gland, which responds to light-induced signals by switching off production of the hormone melatonin. The body’s level of melatonin normally increases after darkness falls, making people feel drowsy. The SCN also governs functions that are synchronized with the sleep/wake cycle, including body temperature, hormone secretion, urine production, and changes in blood pressure. To reduce the effects of jet lag, some doctors try to manipulate the biological clock with a technique called light therapy. They expose people to special lights, many times brighter than ordinary household light, for several hours near the time the subjects want to wake up. This helps them shifting their biological clocks towards a new time zone.

COMBATING JET LAG
Light therapy
The goal of light therapy is to make a shift in the biological rhythm of a person [3, 5, 7]. Light is responsible for the production serotonin (hormone activity) and dopamine (attention hormone), which this levels influence in the biological clock. The brightness level of the sun on earth in summer can be up to150,000 lux (unit of luminous intensity) and as low as 500 lux in the winter. Outside light below 2,000 lux can result in mood changes for a group of people. In this case light therapy can be applied as treatment with fluorescent lamps with a brightness between 2,500 and 10,000 lux. It is best to begin treatment with less intensity lamps and be progressively increasing, while increasing the exposure time. The results of the light therapy are immediate.
Dawn simulation
A therapy used to treat seasonal affective disorder (SAD) is the dawn simulation [10]. Typically, the treatment involves timing lights in the bedroom to come on gradually, over a period of 30 minutes to 2 hours, before awakening. Dawn simulation generally uses light sources that range in luminance from 100 to 300 lux, while bright light boxes are usually in the 10,000 lux range. Approximately 19% of patients discontinue post-awakening bright light therapy due to inconvenience. Because the entire treatment is complete before awakening, dawn simulation may be a more convenient alternative to post-awakening bright light therapy. In terms of efficacy, some studies have shown dawn simulation to be more effective than standard bright light therapy while others have shown no difference or shown that bright light therapy is superior. Some patients with SAD use both dawn simulation and bright light therapy to provide maximum effect at the start of the day. That’s why we found interesting to apply both treatment’s while flying in order to create a more powerful and efficient solution for the passenger.

PROJECT DESCRIPTION
The goal this project was to enrich the experience of passengers in air travel. Focusing on shifting the circadian rhythm of the passenger using light in order to minimize jet lag after arriving on a new destination with different time zone. The design should fit their needs with special regard to their travel conditions, such as number of crossed time zones, local departure and destination time, flight duration, etc that directly influences the physiological aspects of the passenger.

Concept description
The design focuses on the reduction of the Jet lag of the passengers and will be used in the aircraft cabin interior as an illumination system. The developed concept is a lamp, which provides two therapies to the passengers while flying: light therapy and dawn simulation. These two therapies help to advance or delay the circadian clock of the passenger in order to adjust to the destination time zone. After travelling the passenger will be prepared for the new time conditions with minimized Jet Lag symptoms. The lamp will work during the flight giving the passengers the necessary light and darkness conditions inside the cabin. As stated before the lamp provides two different therapies dawn simulation and light therapy. Dawn simulation consists in simulating the sunrise 1 hour before awaking. Light therapy consists in simulating the brightness of a sunny day (2000- 10,000 lux). To get the expected reaction in the passenger, the whole cabin needs to fit to the ideal lighting conditions, giving the passengers an enriched flying experience.

CONCLUSIONS
In general, the idea to reduce Jet Lag is to try to adapt as quickly as possible to the new time zone. Providing two therapies that can influence the circadian rhythm during the flight could possibly shift the internal biological clock in order to adjust faster to the new destination time zone. As already mentioned, there is no magic potion to eliminate jet lag, but this type of lighting can influence the passengers in order to adjust as fast as possible to the new time zone.

REFERENCES