

## Abstract

### **The chronobiology of travel**

Healthy sleep requires our biological circadian clocks to be synchronised to the natural alternations of light and darkness. Circadian entrainment or synchronisation specifies sleep to specific times of day or phases, leading to a variety of chronotypes. The human circadian clock is only sensitive to the effects of light at specific times of day. Rapid time zone travelling introduces light at non-optimal times and interferes with circadian synchronisation and the timing of sleep. From both field studies and controlled laboratory studies there is ample evidence showing the detrimental effects of improper light exposure on sleep, health and performance. The phenomenon of jetlag after rapid time zone travel results because circadian clocks adjust slowly to changes in light-dark cycles. For example, when we depart from New York at 18:00 h local time to Paris arriving at 08:00 h local time in the morning, our internal clocks are still synchronised to New York time. That means that for our internal clocks it is subjective midnight when we arrive in Paris in the morning. This delay in circadian adjustment leads to the side effects of jetlag with increased feelings of sleepiness, discomfort, malaise, fatigue, trouble concentrating, decreased alertness, memory problems, dizziness, and feelings of lethargy. Chronotype (e.g. early 'lark' or late 'owl') plays a pivotal role in this process of circadian re-entrainment after time zone crossing. In addition, the following factors are to be considered: number of times zones crossed, travel direction (east or west), time of sunrise & sun set at origin & destination, duration of the flight, time of day of the flight (day or night flight), and habitual times of sleeping & waking. Understanding the principles of circadian entrainment is central to understand the consequences of jetlag and to be prepared for a less cumbersome journey.

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