Light interventions: a novel approach for sustaining sleep quality and quantity of elite swimmers under conditions of shifted circadian rhythm

Argyraki, Aikaterini; Andersen, Jakob Hildebrandt; Johansen, Lars; Adler, Andreas Top; Broeng, Jes; Petersen, Paul Michael

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain.
- You may freely distribute the URL identifying the publication in the public portal.

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.
Light interventions: a novel approach for sustaining sleep quality and quantity of elite swimmers under conditions of shifted circadian rhythm

Aikaterini Argyraki\textsuperscript{1}, Jakob Hildebrandt Andersen\textsuperscript{2}, Lars Johansen\textsuperscript{3}, Andreas Top Adler\textsuperscript{3}, Jes Broeng\textsuperscript{2}, Paul Michael Petersen\textsuperscript{1}

\textsuperscript{1} Department of Photonics Engineering, Technical University of Denmark, Frederiksborgvej 399, DK-4000, Roskilde, Denmark
\textsuperscript{2} Department of Photonics Engineering, Technical University of Denmark, Ørsted Plads, 2800 Kgs. Lyngby, Denmark
\textsuperscript{3} Team Denmark, Brøndby Stadion 20, 2605 Brøndby, Denmark

ABSTRACT

For the 2016 Olympics at Rio De Janeiro the Danish swimmers was facing a very important problem, how to maintain a good sleep quality, quantity and high performance potential\textsuperscript{1,2}, while being subject to large shift in circadian rhythm. In the present study we suggest an alternative approach for sustaining sleep quantity and quality, namely light interventions. A light program, comprising of alternating blue enhanced white light and blue suppressed white light, was designed to complement the activities of elite Danish swimmers after arriving to preparation/training camp; mimicking the conditions expected in the 2016 Summer Olympics in Rio (5-10 hours shift in circadian rhythm). The sleep patterns of the swimmers were monitored throughout two different phases: the baseline period, registered both before and after the intervention; and the preparation period (intervention). Sleep duration, efficiency, latency, percentages of light, deep or REM sleep were the variables under investigation. The sleep output was modeled (ANOVA) with subject as a random effect and phase as fixed effect. It was observed that the light program during the intervention phase significantly enabled the conservation of sleep quantity and quality of the swimmers, despite the shifted circadian rhythm. The hypothesis of no effect of phase of experiment on sleep duration, efficiency, latency, percentage of light, deep and REM sleep were all accepted with p. values 0.17, 0.53, 0.90, 0.38, 0.57 and 0.52, respectively. The swimmers commented only positively the light interventions and decided to use them at Olympics 2016. No side effects were observed.

Light interventions could become an alternative simple tool for coaches and elite swimmers to improve sleep patterns in occasions of disturbed circadian rhythm conditions (different time zones, uncomfortable competition times). Contrary to other methods for improving sleep pattern (e.g. sleeping pills) light interventions carry minimal risk for severe side effects\textsuperscript{3}.

REFERENCES