Effectiveness of blue light-emitting glasses for intensive care unit health care workers on night shifts during the COVID-19 pandemic

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LETTER

Effectiveness of blue light-emitting glasses for intensive care unit health care workers on night shifts during the COVID-19 pandemic

Anne-Loes Opperhuizen[1,2*], Ilse M. J. van Lier[2], Steffen L. Hartmeyer[3], Mariëlle P. J. Aarts[4] and Jos L. M. L. le Noble[5,6]

Dear Editor,

The coronavirus disease 2019 (COVID-19) pandemic has tremendously increased work pressure on health care workers, leading to additional work and longer night-shifts, increasing the risk for work-related accidents. The Dutch Society of Occupational Medicine recently published guidelines on strategies to mitigate the negative consequences of shift work [1], including the manipulation of light exposure. We conducted a single-blind, randomized, placebo-controlled crossover study in a cohort of intensive care unit (ICU) and emergency room (ER) nurses during the COVID-19 pandemic. We hypothesized that wearing blue light-emitting glasses (BLEG) during night shifts would positively affect sleepiness and work-related fatigue.

The protocol, questionnaires on sleepiness and sleep quality, and analyses used were identical to those used by Aarts et al. [2]. In total, 19 (4 males) ICU and ER nurses at a large teaching hospital were included between December 2020 and October 2021 (Fig. 1A). Nurses were instructed to wear BLEG (Propeaq BV, The Netherlands) and placebo glasses for (1) 4×15 min per night at 00:00, 01:00, 02:00, and 03:00 and (2) 30 min within 2 h after waking up (cf. [2] for a detailed description of the protocol).

Analyses showed that sleepiness was slightly reduced during three accumulated night shifts ($p = 0.036$, Fig. 1B) with BLEG use compared with placebo glasses. Sleepiness during the morning commute (driver sleepiness), sleepiness during the day, and sleep quality were equal between the conditions.

When comparing the findings of our study with a previous study [2], we found a similar trend in sleepiness and sleep quality across different nights. Contrarily, we observed that BLEG did not affect driver sleepiness after the first night. A possible explanation may be that the present study was conducted during the COVID-19 pandemic, during which more acute stress was experienced.

When analyzing the combined data of both studies, the only significant effects of BLEG were reduced driver sleepiness after the first night shift ($p = 0.016$) and an overall decrease in sleep quality ($p = 0.021$) compared with the placebo condition.

Previous studies have reported the potential of a brighter environment on reducing sleepiness in ICU nurses and security guards [4, 5]. However, the effect we observed was very limited. This may be due to the type of light exposure and the small sample size.

One participant reported dizziness as an adverse effect. The limitations of our study include lack of objective sleep data and timing of the measurements, as the largest part of the study was carried out during the

*Correspondence: a.opperhuizen@lumc.nl
[1] BioClock Consortium, Cell and Chemical Biology, Department Neurophysiology, Leiden University Medical Center, Leiden, The Netherlands
Full author information is available at the end of the article

A

Participant demographics for VieCurie MC data (N = 19, 4 males)

	Mean	SD	Median	IQR	N
Age (years)	35.1	11.7	29.5	17.25	
Working experience (years)	14.4	12.6	10	17.75	
Working week (hours)	33.2	5.4	36	6.25	
Monthly nightshifts	5.8	1.8	5.5	2.25	
Chronotype (MSF_E) (hh:mm)	04:13	00:48	03:57	01:09	
Early (MSF_E < 03:00)					0
Intermediate (MSF_E = 03:00–05:00)					5 (26%)
Late (MSF_E > 05:00)					1 (5%)
Undefined					13 (68%)

Notes. MSF_E = Midsleep on free days after evening shifts (Munich Chronotype Questionnaire for Shiftworkers, MCTQShift [3]).

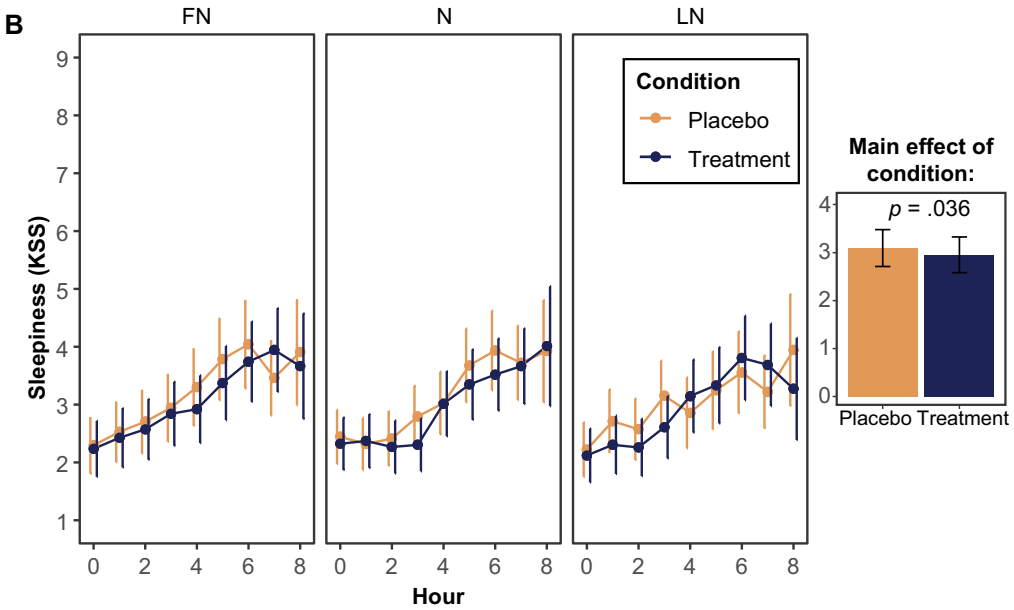

Fig. 1 **A** Participant demographics (N = 19, 4 males). **B** Subjective sleepiness (Karolinska Sleepiness Scale, KSS) during nightshifts (*FN* first night; *N* intermediate nights; *LN* last night) for the treatment and placebo conditions. Values are estimated marginal means from the linear mixed model analysis with condition, nightshift, and hour as fixed factors and subject as random factor. The main effect of condition across all nightshifts was statistically significant (Treatment 2.96 vs. placebo 3.10, $p = 0.036$)

summer season which may reduce the additional light of the BLEG. The chosen protocol was chosen for feasibility but does not exclude differential effects of other exposure protocols. Lastly, the influence of stimulants such as caffeine could not be excluded.

In conclusion, this is the first ICU and ER study conducted regarding the negative consequences of working night shifts during the COVID-19 pandemic. In this study, wearing BLEG was not shown to be very effective to reduce sleepiness. However, more data are needed to draw definite conclusions.

Author details
[1] BioClock Consortium, Cell and Chemical Biology, Department Neurophysiology, Leiden University Medical Center, Leiden, The Netherlands. [2] Chair Youth, Food & Health, Maastricht University Campus Venlo, Venlo, The Netherlands. [3] Laboratory of Integrated Performance in Design (LIPID), École polytechnique fédérale de Lausanne (EPFL), Lausanne, Switzerland. [4] Department of the Built Environment, Eindhoven University of Technology, Eindhoven,

The Netherlands. [5] Department of Pharmacology and Toxicology, Maastricht University, Venlo, The Netherlands. [6] Department of Intensive Care, VieCuri Medical Center, Venlo, The Netherlands.

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Author contributions
All authors contributed to the conception and design of this study. Material preparation, data collection, and analyses were performed by IL, SH, and ALO. The first draft of the manuscript was written by ALO and JN, and all the authors commented on the previous versions of the manuscript. All authors have read and approved the final version of the manuscript.

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Data availability
All data supporting the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Conflicts of interest
The authors declare no conflicts of interest.

Ethical approval
Permission to use the data was granted by the Medical Ethics Committee.

Consent to participate
All participants provided written informed consent.

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