A light-Relaxation Session for Hospital Healthcare Workers: A Pilot Study of Feasibility, Acceptability, and Short-Term Effects (The RELAX study)

INTRODUCTION:

The COVID-19 pandemic has highlighted the importance of healthcare workers and recent research shows a strong correlation between nurse burnout and their intention to leave their job (1).

For decades, the effects of audiovisual stimulation have been studied, particularly those of pulsed light, known for its relaxing and stimulating properties. Studies, including those by NASA, have shown that light and rest can improve performance and attention (2). In the early 2000s, the discovery of melanopsin led to a better understanding of the impact of blue light on arousal, memory, and alertness (3,4). Short blue wavelengths (450–475 nm), play an essential role in synchronizing the circadian rhythm, which is regulated by the suprachiasmatic nucleus of the hypothalamus. Proper circadian alignment is crucial for mental and neurological health (5,6)

From a physiological point of view, light influences hormone secretion (melatonin, cortisol, serotonin, etc.) which regulates the sleep-wake cycle. Studies have shown that pulsed blue light delivred through closed eyelids suppresses melatonin and phase shifts the human circadian system(7). Finally, preclinical studies shown that 40 Hz light stimulation can reduce amyloid pathology in animal models Alzheimer's (8) , and this approach is now being tested in early-phase human trials.

These discoveries, combined with research on stress management in athletes and advances in relaxation technologies, have directed our interest toward devices that combine light and brain stimulation, adapted to different states of relaxation (eyes open or closed). This could subsequently be used in stressful situations such as what was observed during the pandemic.

Research question

The aim of this pre-post pilot study was to evaluate the acceptability of light-relaxation session among healthcare providers, as well as its short-term effects on relaxation and eye-open status.

MATERIALS AND METHODS:

Sample and Recruitment:
This single-group pre-post pilot study was conducted at an academic hospital in Belgium between August 11,2022 and May 7,2023. All categories of healthcare professionals working at the hospital were eligible. Candidates were selected based on the inclusion and exclusion criteria described below to avoid any discrimination.
Staff were informed of the study through the quality department via intranet, reaching 6226 professionals. Initially, they could register for a session through the hospital's online scheduling platform (Talentsoft), choosing the time slot that suited their availability; 67 professionals registered. As the target of 100 professionals was not reached through this route, recruitment was completed with additional volunteers who contacted the research team directly (33

volunteers). Of the 109 professionals who expressed interest, 9 were excluded or did not attend, and 100 completed a session. Participation was voluntary; participants were not randomly selected.

Sample size:
No formal size calculation was performed, as this pilot study aimed to assess acceptability and short-term changes rather than to test a predefined hypothesis. The target of 100 participants was chosen pragmatically. This size allows proportions (e.g., satisfaction) to be estimated with reasonable precision (for a proportion of 50%, the 95% confidence interval extends approximately 10 % points) and for paired comparison, detects standardized differences of about 0.3 (80% power, two-sided α=.05), while remaining feasible given the availability of the research team and equipment. The figures are provided for information and do not constitute an a priori power calculation.

Inclusion and exclusion criteria
Knowing that less than 5% of people with epilepsy have photosensitive epilepsy (most common in young people, particularly around puberty), we preferred to provide continuous light to participants with epilepsy or light sensitivity so that visual stimuli such as flashing lights would not potentially trigger a photosensitive seizure.
Since the technology uses different sounds and words in each ear, participants suffering from unilateral deafness or schizophrenia were excluded (as a precautionary measure to avoid triggering verbal hallucinations or delusions).

Equipment:
An MP3 device (PSiO version 2.0 designed PSiO Technologies, Cap Zen International SRL, Chaussée de Louvain 431 D-1380 Lasne in Belgium) integrates light-relaxation through voice and music. A pair of glasses was loaned by a medical practice for the purposes of this research; the manufacturer played no role in the design, conduct, or reporting of the study. The wavelengths of the glasses are 625 nm (red), 528 nm (green), and 470 nm (blue). For audio, a pair of noise-cancelling headphones was connected via an audio cable to the glasses' stereo output. Light intensity is adjustable but was set to the lowest level for this study. The device was reviewed by the hospital's ophthalmology department, which confirmed it was safe for ocular use.
The principal investigator was trained in the use of the equipment by the manufacturer prior to the study.

Setting and timing:
Session took place between 11:00 and 16:00, after participants'patient-care activities, in a dedicated room within the hospital. A maximum of 5 participants were present in the room at the same time.

Measures (blood pressure, SPO2, HR):
Blood pressure was measured with a manual device (WelchAllyn – pressostabil-CE0297) at the level of the right arm (after the installation in the chair and 5 minutes of rest). For the measurement of SPO2 and HR, we used a pulse oximeter (mindray PM-60) place in the installation of the participant and validate after 5 minutes of rest (before the measurement of the blood pressure). The same procedure was used before and after the session.

Procedure:
The light-relaxation session was performed as follows:
1. Place a protective cover over the earphones and check the battery and wiring.
2. The participant is seated and positioned in the ‘Relax / zero gravity’ pose for the light-relaxation session.
3. Ask the person to turn off their phone and connected watch or put them in aeroplane mode and without vibration.
4. Collect the parameters as specified in the questionnaire.
5. Ensure there are no exclusion criteria nor epilepsy.
6. Adjust the lighting and sound level according to the participant's hearing sensitivity.
7. Do not disturb during the experiment.
8. Provide a blanket, since relaxation is associated with peripheral vasodilation and drop in body temperature(9).
9. Choose the ‘Stress Management’ session in pulsed light mode or the ‘Stress Management’ session in continuous light mode if the person is epileptic, hypersensitive to light or has a specific eye problem.
10. Measurement of clinical parameters at the start of a light-relaxation session: heart rate, pulsed oxygen saturation, and systolic and diastolic blood pressure
11. The investigator manually started the light-relaxation session. The session lasts 30 minutes and stops automatically.
12. Measurement of the same parameters at the end of the light-relaxation session.
13. Completion of the questionnaire.

Questionnaire:
The 'Relax Study' satisfaction survey used a one-page, 25-question paper questionnaire for easy data entry at the participant's bedside. (Appendix A)
The themes of the questionnaire were:

- Participant's sector in the institution and age.
- Measuring stress levels on a numerical scale from 0 (no stress) to 5 (high stress).
- Measuring energy levels on a numerical scale from 0 (no energy) to 5 (full of energy)
- Pain is measured on a scale from 0 (no pain) to 10 (maximum pain)
- A nausea and vomiting scale (numerical scale from 0 = no nausea to 4 = vomiting)
- light-relaxation session's impact on eye opening during different stages of the session (beginning, middle and end)
- Questions regarding individuals' feelings, the purpose of relaxation, and the length of the session
- The equipment quality
- Strengths, weaknesses, and improvement suggestions.

The data were encoded using Survey MANAGER V7 software from soft concept.

Ethics and confidentiality:
This research adheres to the General Data Protection Regulation (GDPR) and the rules from the Hospital-Faculty Ethics Committee. The equipment used is available on the market, and was used for authorized purposes, and involves healthcare staff rather than participants. Therefore, the ethics committee indicated that its opinion was not required for this research, given that it involved volunteers and hospital staff members.
Each completed questionnaire was assigned a unique and anonymous number randomly by the principal investigator who encoded the data. Permission from the department manager was

requested and granted. The study did not include any patient data. Participation in the study implied consent to partake in the research.

Statistics:

Statistics were performed by an independent statistician. Continuous variables were expressed as mean ± standard deviation or as mean with corresponding minimum and maximum values, as appropriate. Comparisons of pre- and post-intervention values were performed using a paired Student's t-test. All statistical tests were two-tailed, and a p-value < 0.05 was considered statistically significant.

RESULTS

Characteristics of the respondents: (Table 1)

During the period between August 11, 2022 and May 7, 2023, a total of 100 hospital professionals voluntarily participated in the study, with a mean age of 42.53 years (range: 25-65). The sample consisted predominantly of women (91%). Participants came from intensive care (25%), recovery room (11%), and other hospital departments (63%). One person did not specify its workplace. Most participants (92%) experienced the session in pulsed-light mode using a standardized "stress management" program, while 8 used continuous light mode in accordance with the precautions explained in the inclusion/exclusion paragraph.

Table 1: Respondent Characteristics (N=100)

Characteristic	Category	n (%) or Mean ± SD
Gender	Women	91 (91%)
	Men	9 (9%)
Work setting	Intensive Care Unit (ICU)	25 (25%)
	Recovery room	11 (11%)
	Other clinical units	63 (63%)
Age (years)	Mean age	42.5 years
Stress-management condition	Pulsed light	92 (92%)
	Continuous light	8 (8%)

Parameters:

Before and after the light-relaxation session, we measured various parameters: Heart rate, Blood Pressure, Pulse oxygen saturation, and according to numeric scale level of stress, energy level, pain level, and degree of nausea.

Table 2: Results of parameters before and after light-relaxation session. (Results displayed as mean +/- standard deviation)

Variable, mean (standard deviation)	Before	After	Difference	P-value
Heart rate (bpm)	73.35 (10.39)	70.70 (9.01)	3.65%	.0022
Systolic blood pressure (mmHg)	114.4 (15.9)	109.0 (14.0)	5.99%	<.001
Diastolic blood pressure (mmHg)	65.0 (10.4)	61.4 (11.1)	5.85%	.0002
SpO2 (%)	98.50 (1.32)	99.01 (1.12)	0.5%	<.001
Level of stress (numeric scale from 0 to 5)	2.54 (1.41)	1.01 (1.12)	60%	<.001
Energy level (numeric scale from 0 to 5)	3.08 (1.12)	3.58 (1.21)	16.35%	<.001
Pain (numeric scale from 0 to10)	1.24 (1.07)	1.12 (0.70)	/	.076

We asked participants about the state of their eyes at the beginning, middle, and end of the session (figure 2).

Figure 2: Self-reported eye status during light-relaxation session (N=100).

Phase of the session	Eyes open (%)	Eyes closed (%)
Beginning	35%	65%
Middle (relaxation)	9%	91%
End	14%	86%

Note: Eye status was self-reported by participants at each phase of session.

Global feedback of the experience is described in table 3.

Table 3: Results of participant's feedback after light-relaxation session.

Feedback	**YES**	**NO**	**no answer**
Positive Experience	99	0	1
Repeat session	94	5	1
Relaxation objective ACHIEVED	95	3	2

Participants' Subjective Experiences

Participants reported a wide range of physical and emotional sensations during the session. The most frequently mentioned feeling was a sense of relaxation (22 times). Additionally, 11 participants mentioned a state of feeling good or relaxed, while 10 mentioned a sense of release. Feelings of heaviness were reported by 4 participants, and 2 individuals described tingling sensations in the hands or face.
Beyond these commonly reported sensations, several unique experiences were also noted. These included tension in the lower back, sensations of lightness and floating, perceptions of wind or energy, a feeling of no longer sensing one's body, and the impression of being transported elsewhere (such as into nature or to pain). Some participants reported drowsiness or the sensation of being on the edge of sleep. Other comments included reduced hand tension, a general sense of calm, chills, coolness in the back, simultaneous sensations of cold and heat, and warmth in the chest.

Less Pleasant Sensations
Eleven participants (11%) reported adverse subjective sensations during the session. These included feeling naturally nervous, being stressed by the pulsed light, experiencing knee pain, and having difficulty processing dual simultaneous voices. Other discomforts mentioned were a cold sensation in the hands, dry mouth, sore eyes, and the onset of a headache triggered by the pulsed light.

Physical sensations

54 out of 100 participants described physical reactions to the intervention. Nine participants reported a floating sensation, while seven experienced numbness or a "sleeping" feeling in the arms or hands. Six individuals mentioned a state of relaxation or a sense of freedom. Feelings of heaviness were reported by five participants. Additionally, four participants each described sensations of being relaxed, simply relaxing, or feeling cold.

Session Duration for light-relaxation session

The light-relaxation session lasted 30 minutes as explained in the procedure. Without revealing the actual duration, we asked the patient how long they thought it lasted. On average, they felt it was 22.01 minutes (ranging from 10 to 30 minutes).

Perceived quality of equipment

Feedback on the quality of the equipment was overall very positive: the majority of participants (n = 95) found the device comfortable, while only 3 expressed discomforts. 99 participants reported no technical problems. Adjusting the device was considered easy by 97 of them, and 99 felt that the equipment was simple to use. Finally, 98 participants confirmed that it was possible to adjust the basic settings, particularly the sound (3/5) and light (1/4).

Highlights of light-relaxation session

After the light-relaxation session, participants were invited to describe what they perceived as the main strengths of the device. On the 100 participants, 16 gave feedback. Overall, it highlighted the soothing quality of the experience. The most frequently cited strength was the calming voice, music, and sound quality (4/16), followed by a general sense of well-being (3/16). Participants also appreciated the equipment itself, the absence of external noise when wearing the headphones (2/16), as well as the overall pleasantness of the session (2/16). Individual comments further emphasized the immersive and calming nature of the intervention, with participants describing the sensation of being "in their own bubble," feeling calm, and being able to disconnect from their thoughts. One participant also noted that the light remained effective even with the eyes closed, which reinforced the immersive quality of the session. A single negative comment mentioned that the glasses felt hard, suggesting a minor area for improvement.

Volunteer's perceived limitations of light-relaxation session

While many participants reported positive sensations, of the 100 participants, 21 identified negative aspects of the experience. The main weakness reported (n = 10) concerned the discomfort associated with the pulsed light, which was considered unpleasant or too stimulating, particularly at the start of the session. Other isolated comments concerned physical adjustment problems, such as rigid glasses, headphones that were too large or uncomfortable, a headband that was too long for small heads, or discomfort caused by a face mask.

Some criticisms concerned the physical environment, in particular ambient noise, an unsuitable chair, or the impossibility of falling asleep because of disruptive sound elements. One comment also highlighted an anxiety-provoking awareness of the critical state of consciousness induced by the session, and another mentioned specific difficulty for people suffering from back pain.

These comments underline the importance of fine-tuning the devices and the environment to maximize the comfort and effectiveness of the sessions.

Light-relaxation session improvement Suggestions:

Among the 100 participants, 19 provided suggestions to enhance the light-relaxation session experience. The most common recommendation (n=5) was to use continuous rather than pulsed light. Others mentioned discomfort due to a tight helmet or distractions such as external noise or phone use. Individual suggestions included increasing light intensity, using a heated blanket, adjusting body position (e.g., outstretched arm), or conducting sessions in environments like a swimming pool or with seawater. Some also expressed difficulty following two simultaneous audio narratives and suggested simplifying this aspect.

DISCUSSION

This study evaluated the feasibility and potential benefits of light-relaxation among healthcare workers. The procedure offered several practical advantages, including ease of use, good participant comfort, and minimal technical requirements, as it can be performed in a confined space with basic equipment. Proper user training, appropriate device settings, and a relaxation-friendly environment were identified as essential conditions for optimal use. In the field of clinical hypnosis, several schools of thought have developed over time, including Ericksonian hypnosis (10). The technology we use combines a specific from of light-relaxation session with the principles of medical therapeutic hypnosis, drawing inspiration from Ericksonian approaches.

Comparisons of physiological and subjective parameters before and after the session indicated several changes. Heart rate decreased from 73.4 bpm to 70.7 bpm (p=.002), and systolic and diastolic blood pressure decreased from 114/65 to 109/61 mmHg (both p<.001). Self-reported stress decreased from 2.54 to 1.01 on a scale 0-5 scale (p<.001), while energy levels increased from 3.08 to 3.58 (p<.001). Oxygen saturation increased slightly (98.5% to 99%; p<.001), a change of limited clinical relevance. Eleven percent of participants reported an unpleasant sensation during the session, most often related to the pulsed light, including one reported headache. The observed physical and sensory reactions (whether pleasant or less comfortable) demonstrate the wide variability with which each individual perceives and integrates this type of intervention. They underscore the importance of a truly personalized and adaptable approach. These subjective experiences highlight the diversity, but also the intensity, of the responses elicited, suggesting both a physiological and psychological engagement.

The session lasted 30 minutes, although participants perceived it as shorter (mean perceived duration: 22.01 minutes). Eye-closure observations (self-reported) suggested progressive relaxation during the session, with 91% of participants closing their eyes at mid-session. Overall, the relaxation objective was achieved in 95% of participants, and the experience was considered positive in 99% of cases. Additionally, 94% of participants expressed interest in repeating the intervention. The most frequently reported benefit was a sense of relaxation and well-being, although 10% of participants reported discomfort related to pulsed light. These comments offer valuable insights for optimizing future sessions to improve comfort and engagement.

These results suggest that light-relaxation could be a feasible and acceptable intervention to promote relaxation and well-being among healthcare workers. This type of technology could

be used in a context of heightened occupational stress. Following a recent review and meta-analysis of randomized controlled trials(6), an additional avenue of research could help healthcare workers (as well as anyone working irregular shifts, i.e., morning, evening, and night) achieve better sleep quality.

Limitations:

This study has several limitations. First, this was a single-group pre-post pilot study without a control group; consequently, the observed changes cannot be attributed to the light-relaxation session itself and may partly reflect rest, guided audio, or participant's expectations. Second, participants were self-selected volunteers rather than randomly sampled, and the sample was predominantly female (91%), which may limit the generalizability of the findings. Third, most outcomes (stress, energy, pain, eye closure, and overall experience) were self-reported, and the questionnaire used was not a validated instrument. Fourth, participants attended a single session with no follow-up over time, so the durability of the observed changes is unknown. Fifth, no correction for multiple testing was applied across the seven outcome measures, which increases the risk of false-positive findings. While several differences were statistically significant, discussion of their clinical relevance warrants caution, particularly for outcomes with small absolute changes (e.g., oxygen saturation). The number of participants, while adequate for a pilot study, remains limited (n = 100). A session with up to five people at a time could also raise concerns about background noise, privacy, and social influence. Finally, this research was conducted among healthcare staff at a single hospital, which may limit transferability to other settings. After training healthcare staff on the technology, a follow-up study could examine light-relaxation in a controlled design with validated measures and repeated sessions.

Implications for Practice

Findings from this single-group pilot study suggest a brief light-relaxation session is feasible and well accepted by hospital healthcare workers. The session was followed by short-term reductions in self-rated stress, heart rate, and blood pressure, together with higher self-rated energy. Nearly all participants reported a positive experience, and most would repeat it.
Although the findings require confirmation in future studies with larger samples and stronger study designs, healthcare institutions could consider exploring the feasibility of offering short light-relaxation sessions on a voluntary basis as part of a staff well-behind and recovery program, for example in a quiet dedicated room or an available hospital room during working hours.

CONCLUSIONS

In this single-group pilot study, a brief light-relaxation session was well accepted by hospital healthcare workers: 99% reported a positive experience, 95% felt they had reached a state of relaxation, and 94% would repeat the session. The session was followed by short-term reductions in self-rated stress, heart rate, and blood pressure, and by higher self-rated energy. However, without a control group, the changes cannot be attributed to the light itself and may reflect rest, guided audio, or participant's expectations. Controlled studies using validated measures are needed to confirm these effects and to determine whether light-relaxation sessions can be integrated into staff well-being programs.

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