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Workplace lighting for improving alertness and mood in daytime workers.
Cochrane Database of Systematic Reviews 2018, Issue 3. Art. No.: CD012243.
DOI: 10.1002/14651858.CD012243.pub2.

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[Intervention Review]

Workplace lighting for improving alertness and mood in daytime workers

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Editorial group: Cochrane Work Group.
Publication status and date: New, published in Issue 3, 2018.

Citation: Pachito DV, Eckeli AL, Desouky AS, Corbett MA, Partonen T, Rajaratnam SMW, Riera R. Workplace lighting for improving alertness and mood in daytime workers. *Cochrane Database of Systematic Reviews* 2018, Issue 3. Art. No.: CD012243. DOI: 10.1002/14651858.CD012243.pub2.

ABSTRACT

Background

Exposure to light plays a crucial role in biological processes, influencing mood and alertness. Daytime workers may be exposed to insufficient or inappropriate light during daytime, leading to mood disturbances and decreases in levels of alertness.

Objectives

To assess the effectiveness and safety of lighting interventions to improve alertness and mood in daytime workers.

Search methods

We searched the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, Embase, seven other databases; ClinicalTrials.gov and the World Health Organization trials portal up to January 2018.

Selection criteria

We included randomised controlled trials (RCTs), and non-randomised controlled before-after trials (CBAs) that employed a cross-over or parallel-group design, focusing on any type of lighting interventions applied for daytime workers.

Data collection and analysis

Two review authors independently screened references in two stages, extracted outcome data and assessed risk of bias. We used standardised mean differences (SMDs) and 95% confidence intervals (CI) to pool data from different questionnaires and scales assessing the same outcome across different studies. We combined clinically homogeneous studies in a meta-analysis. We used the GRADE system to rate quality of evidence.

Main results

The search yielded 2844 references. After screening titles and abstracts, we considered 34 full text articles for inclusion. We scrutinised reports against the eligibility criteria, resulting in the inclusion of five studies (three RCTs and two CBAs) with 282 participants altogether. These studies evaluated four types of comparisons: cool-white light, technically known as high correlated colour temperature (CCT) light versus standard illumination; different proportions of indirect and direct light; individually applied blue-enriched light versus no treatment; and individually applied morning bright light versus afternoon bright light for subsyndromal seasonal affective disorder.

We found no studies comparing one level of illuminance versus another.

We found two CBA studies (163 participants) comparing high CCT light with standard illumination. By pooling their results via meta-analysis we found that high CCT light may improve alertness (SMD −0.69, 95% CI −1.28 to −0.10; Columbia Jet Lag Scale and the Karolinska Sleepiness Scale) when compared to standard illumination. In one of the two CBA studies with 94 participants there was no difference in positive mood (mean difference (MD) 2.08, 95% CI −0.1 to 4.26) or negative mood (MD −0.45, 95% CI −1.84 to 0.94) assessed using the Positive and Negative Affect Schedule (PANAS) scale. High CCT light may have fewer adverse events than standard lighting (one CBA; 94 participants). Both studies were sponsored by the industry. We graded the quality of evidence as very low.

We found no studies comparing light of a particular illuminance and light spectrum or CCT versus another combination of illuminance and light spectrum or CCT.

We found no studies comparing daylight versus artificial light.

We found one RCT (64 participants) comparing the effects of different proportions of direct and indirect light: 100% direct lighting, 70% direct lighting plus 30% indirect lighting, 30% direct lighting plus 70% indirect lighting and 100% indirect lighting. There was no substantial difference in mood, as assessed by the Beck Depression Inventory, or in adverse events, such as ocular, reading or concentration problems, in the short or medium term. We graded the quality of evidence as low.

We found two RCTs comparing individually administered light versus no treatment. According to one RCT with 25 participants, blue-enriched light individually applied for 30 minutes a day may enhance alertness (MD −3.30, 95% CI −6.28 to −0.32; Epworth Sleepiness Scale) and may improve mood (MD −4.8, 95% CI −9.46 to −0.14; Beck Depression Inventory). We graded the quality of evidence as very low. One RCT with 30 participants compared individually applied morning bright light versus afternoon bright light for subsyndromal seasonal affective disorder. There was no substantial difference in alertness levels (MD 7.00, 95% CI −10.18 to 24.18), seasonal affective disorder symptoms (RR 1.60, 95% CI 0.81, 3.20; number of participants presenting with a decrease of at least 50% in SIGH-SAD scores) or frequency of adverse events (RR 0.53, 95% CI 0.26 to 1.07). Among all participants, 57% had a reduction of at least 50% in their SIGH-SAD score. We graded the quality of evidence as low.

Publication bias could not be assessed for any of these comparisons.

Authors' conclusions

There is very low-quality evidence based on two CBA studies that high CCT light may improve alertness, but not mood, in daytime workers. There is very low-quality evidence based on one CBA study that high CCT light may also cause less irritability, eye discomfort and headache than standard illumination. There is low-quality evidence based on one RCT that different proportions of direct and indirect light in the workplace do not affect alertness or mood. There is very low-quality evidence based on one RCT that individually applied blue-enriched light improves both alertness and mood. There is low-quality evidence based on one RCT that individually administered bright light during the afternoon is as effective as morning exposure for improving alertness and mood in subsyndromal seasonal affective disorder.

PLAIN LANGUAGE SUMMARY

Workplace lighting for improving alertness and mood in daytime workers

What is the aim of this review?

The aim of this Cochrane Review was to find out if specific types of lighting can change levels of alertness and state of mood in daytime workers.

We collected and analysed five studies that addressed this question.

Key messages

Cool-white light, technically known as high correlated colour temperature light, may improve alertness, but not mood, in daytime workers. Cool-white light may also cause less irritation, eye discomfort and headache. Changing the proportions of direct and indirect light in the workplace may not affect alertness or mood. Glasses with mounted LEDs (which stands for light emitting diode) providing blue-enriched light may improve alertness and mood in workers. Personal exposure to bright light during the afternoon improves alertness and mood just as well as personal exposure to bright light in the morning in people exhibiting symptoms that are not severe enough for the diagnosis of seasonal depression. All findings are based on low-quality or very low-quality evidence, therefore, additional studies are still needed.

What was studied in the review?

Light is important in many biological functions, such as the regulation of sleep, and it may influence a person's state of mood and level of alertness. Daytime workers who spend most of the time indoors may be exposed to low light levels during daytime. This may lead to decreased levels of alertness and mood disturbances.

We analysed data from studies that investigated the effects of any type of lighting on alertness and mood in daytime workers performing work indoors. Different types of lighting include cool white light compared to warm light, different levels of light intensity, individually applied light or exposure to daylight.

What are the main results of the review?

We included five studies, with 282 participants. Participants were office and hospital workers. Two studies investigated the effect of cool white light and one study focused on indirect light sources. Two studies investigated the effect of individually administered light using special glasses or a light box (a flat box with a side of translucent glass or plastic that contains a light).

Cool white light may improve alertness, but not mood, and it may cause less irritability, eye discomfort and headache. These findings are based on two studies sponsored by the industry.

Changing the proportions of direct and indirect light in the workplace may not substantially affect alertness or mood.

Blue-enriched light provided using glasses with mounted LEDs may improve alertness and mood.

Individual exposure to bright light using a light box during the afternoon may improve alertness and mood just as well as individual exposure to bright light in the morning in people exhibiting symptoms that are not severe enough for the diagnosis of seasonal depression.

All findings are based on low or very low-quality evidence (due to the small number of studies and participants, and problems in how the studies were conducted), therefore, additional studies are still needed.

We found no studies that investigated the effects of: light intensity, light intensity combined with light colour, or exposure to daylight.

How up-to-date is this review?

We searched for studies up until 17 January 2018.