Spectral properties of phototherapy for seasonal affective disorder: a meta-analysis

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Authors' objectives
To study the spectral properties of phototherapy for seasonal affective disorder (SAD). The authors tested the hypothesis that full-spectrum light is more effective in treating SAD than any other selected spectrum of light.

Searching
The sources searched were: MEDLINE and PsycLIT; an indexed bibliography published by the Society for Light Treatment and Biological Rhythm; relevant chapters in published books; and the bibliographies from retrieved articles. Experts were also contacted for additional studies. Unpublished data were solicited from clinicians and researchers in the field, as listed in Rosenthal's book on SAD (see Other Publications of Related Interest no.3).

Study selection
Study designs of evaluations included in the review
Studies in which the parameters of light therapy were experimentally manipulated in a between- or within-participant design. Both published and unpublished studies were included.

Specific interventions included in the review
Median light intensity (1,700 to 3,500 lux) phototherapy divided into four groups of different wavelengths.

Group 1: full-spectrum light with an ultra-violet (UV) component.
Group 2: cool-white or full-spectrum light without a UV component.
Group 3: medium to long (red) wavelengths.
Group 4: short to medium (green, blue and yellow) wavelengths.

Participants included in the review
People with SAD were included.

Outcomes assessed in the review
Typical depressive symptoms of SAD were measured by the Hamilton Depression Rating Scale (HDRS). Atypical symptoms were also measured, as proposed by William (see Other Publications of Related interest no.1) or Rosenthal and Heffernan (see Other Publications of Related Interest no.2), or versions of these.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the authors performed the selection.

Assessment of study quality
Validity was assessed using the threats-to-validity method, as described by Hedges (see Other Publications of Related Interest no.4). This provided a numerical rating of the degree to which a specific study design controlled for the seven threats to internal validity proposed by Cook and Campbell (see Other Publications of Related Interest no.5). Two individuals evaluated the internal validity of the studies. Before doing so they were provided with definitions of specific terms, such as the seven threats to validity.

Data extraction
Two individuals extracted and coded the data. These were not the same two people who rated the studies for internal validity. An inter-rater reliability index of the coding process was calculated and expressed as the percentage of agreement between the two coders.

Methods of synthesis
How were the studies combined?
The studies were combined using a fixed-effect model for analysis of variance.

How were differences between studies investigated?
Homogeneity was assessed using an unspecified test.

Results of the review
Forty studies (37 published and 3 unpublished) were included. The total number of participants was not stated.

1. Treatment effect sizes of different spectra of light as measured by the HDRS.

   Group 1 (full spectrum light with the ultra-violet (UV) component): the effect size was 1.71 (95% confidence interval, CI: 1.48, 1.94) in the morning, 1.59 (95% CI: 1.30, 1.89) in the evening, and 2.09 (95% CI: 1.81, 2.38) for morning to evening.

   Group 2 (cool-white or full-spectrum light without a UV component): the effect size was 1.98 (95% CI: 1.70, 2.26).

   Group 3 (red wavelengths): the effect size was 0.79 (95% CI: 0.20, 1.39).

   Group 4 (green, blue and yellow wavelengths): the effect size was 1.59 (95% CI: 1.24, 1.93).

2. Treatment effect sizes of different spectra of light as measured by the atypical symptoms.

   Green, blue and yellow wavelengths appeared to be more effective in alleviating the atypical symptoms of SAD (effect size 1.61, 95% CI: 1.15, 2.08) than full-spectrum light with a UV component (effect size 1.14, 95% CI: 0.93, 1.35), or cool-white or full-spectrum light without a UV component (effect size 1.51, 95% CI: 1.27, 1.74). The modified analysis of variance showed a statistically-significant difference in the weighted mean effect sizes between the three groups (chi-squared 7.21, d.f.=1, p<0.05). The effect size produced by group 1 was significantly smaller than that produced by groups 2 (chi-square 4.61, d.f.=1, p<0.05) and group 4 (chi-square 4.39, d.f.=1, p<0.05). There was no statistically-significant difference in the treatment effect size between groups 2 and 4 (chi-squared 0.79, d.f.=1, p>0.05).

Authors' conclusions
The findings suggested that light of short to medium wavelengths (blue, green and yellow) seems to be essential for the therapeutic effect of light on SAD. Furthermore, UV wavelengths are not necessary for the antidepressant effect on SAD either for alleviating the typical or the atypical symptoms. UV wavelengths should not be used in phototherapy for SAD due to their potentially harmful effects.

CRD commentary
The search strategy was relatively comprehensive, but no details of the search terms or dates were given. No details of the studies were provided, either for study design, size, location or population. Although a validity assessment was performed, the results were not reported. The trials were subgrouped by the wavelength used, but no details were provided as to how many studies were included in each subgroup and how many participants were in each. Without this information it is unclear how much weight should be given to the authors' conclusions.

Implications of the review for practice and research
Practice: The authors suggested that light of short to medium wavelengths (blue, green and yellow) seems to be essential...
for the therapeutic effect of light on SAD, but UV wavelengths should not be used in phototherapy for SAD due to their potentially harmful effects.

Bibliographic details

PubMedID
9272195

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Analysis of Variance; Chi-Square Distribution; Confidence Intervals; Humans; Light; Phototherapy /standards; Seasonal Affective Disorder /therapy; Treatment Outcome; Ultraviolet Rays

AccessionNumber
11997001044

Date bibliographic record published
31/07/1999

Date abstract record published
31/07/1999

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.