Dose-response relationship of phototherapy for seasonal affective disorder: a meta-analysis

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Authors' objectives

To evaluate the dose-response relationship of phototherapy for seasonal effective disorder (SAD).

Searching

Articles were sought from the following sources to August 1994: database systems including PsycLIT and MEDLINE available in the libraries of the University of Alberta; indexed bibliography published by the Society for Light Treatment and Biological Rhythm; relevant chapters in published books; bibliography lists of books and articles retrieved; and personal communication with prominent researchers and colleagues in the area. Unpublished data were sought from clinicians and researchers listed in Rosenthals book on SAD (see Other Publications of Related Interest no.4).

Study selection

Study designs of evaluations included in the review

Studies in which parameters of light therapy were experimentally manipulated under between-subjects design or within-subject design were included if the outcome was as described above.

Specific interventions included in the review

Phototherapy of the following intensities was studied: dim light (600 lux or less); medium light (1700 to 3500 lux); and strong light (6000 lux or more). Light was applied at the following times of day: dawn; morning; midday; evening; and morning- evening. Wavelengths of light included full spectrum light with UV wavelengths, cool-white or full spectrum light without UV wavelengths, red wavelengths, and blue/green/yellow wavelengths.

Participants included in the review

Patients with SAD were studied. No definition of this term was given.

Outcomes assessed in the review

The following outcomes were assessed: severity of SAD symptoms evaluated by versions of the Hamilton Depression Rating Scale (HDRS); and/or measurement of atypical symptoms proposed by Rosenthal and Heffernan (see Other Publications of Related Interest no.3), an 8-time scale as proposed by William (see Other Publications of Related Interest no.5), or versions of these (AS).

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

Study quality was assessed using 7 threats-to-validity criteria as described by Cook (see Other Publications of Related Interest no.1). The criteria were not stated. Two raters were employed to score each study according to the degree of control of the validity criteria on a scale from 0 to 2, where zero denoted no control, one denoted partial control, and two full control. Definitions of the 7 threats to validity were provided to raters and a training session was conducted. Inter-rater agreement was assessed.

Data extraction

The following data were extracted and coded by two raters who differed from those scoring validity: identification; research design; sampling; subject characteristics; independent variable characteristics; dependent variable characteristics; statistical data for calculating effect size. A training session was conducted for coders. Inter-coder

agreement was assessed.

Methods of synthesis

How were the studies combined?

A fixed-effect model was used to combine studies. Publication bias was assessed by funnel graph plots and a fail safe N value was estimated.

How were differences between studies investigated?

Each a-priori hypothesis was analysed by gradually removing outliers using Tukey's procedure to reach the required homogeneity requirement at a P level of 0.05 or greater. No details were given about which studies were withdrawn. The difference in means assessed using post-hoc ANOVA was estimated after excluding a dawn study.

Results of the review

A total of 39 articles appear to have been included (995 subjects). It was nor clear if all these studies were included since some may have been subsequently omitted using Tukey's procedure.

Publication bias and the fail safe N value indicated lack of serious publication bias.

Inter validity rater agreement ranged from 70% to 85%. Inter coder agreement on data extraction was about 98%.

Treatment effect measured by HDRS within morning light group: Strong light was significantly more effective than medium light ($P < 0.05$) and medium light was significantly more effective than dim light ($P < 0.05$) in treating SAD. Effect sizes were as follows: dim light 1.13 (95% CI: 0.82, 1.45); medium light 1.74 (95% CI: 1.56, 1.93); and strong light 2.94 (95% CI 2.30, 3.58).

Treatment effect measured by AS within morning light group: no statistically significant difference was present between light intensity groups. Effect sizes were as follows: dim light 1.32 (95% CI 1.03, 1.60); medium light 1.41 (95% CI: 1.15, 1.68); and strong light 1.29 (95% CI: 0.94, 1.63). Exclusion of a dawn study showed no statistically significant difference between the three mean effect sizes.

Treatment effect measured by HDRS within morning-evening light group: medium light produced a significantly larger effect size than dim light. Effect sizes were as follows: dim light 0.60 (95% CI 0.22, 0.97); medium light 2.09 (95% CI: 1.81, 2.38).

Authors' conclusions

These findings show that light intensity varied positively with the antidepressant effect for typical but not for atypical symptoms of SAD, suggesting that light intensity tended to have different therapeutic effects on the typical and atypical symptoms of SAD.

CRD commentary

The aims and inclusion criteria were stated. Both published and unpublished data were sought. Details were given of criteria used to assess validity and the methods used to extract data and evaluate validity. Inter-rater agreement was assessed for validity criteria and data extraction.

Full details of the literature search strategy such as keywords used would have been helpful. No details were given of methods used to select primary studies. Although validity was assessed no results of the validity assessment were reported. More comprehensive details of the included studies would have been welcome, such as study design, criteria used to diagnose SAD, selection and characteristics of patients, duration of therapy, and degree of blinding of outcome assessors. Some of these details were apparently extracted but details were not reported in the review.

Insufficient detail was presented to provide support for the author's conclusions.

Implications of the review for practice and research

Practice: The authors do not report any clinical implications of the review.

Research: The authors consider that future research should employ both the HDRS and the AS and that the Structured Interview Guide for the Hamilton Depression Rating Scale-seasonal affective disorder version (SIGH-SAD) should be considered; that an appropriate placebo control should be developed; and that a comparison of a light visor with a light box should be undertaken.

Bibliographic details

Lee T M, Chan C C. Dose-response relationship of phototherapy for seasonal affective disorder: a meta-analysis. Acta Psychiatrica Scandinavica 1999; 99(5): 315-323

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Other publications of related interest

1. Cook TD, Campbell DT. Quasi-experimentation. Chicago: Rand McNally; 1979.2. Hedges LV. Fixed effects models. In:Cooper H, Hedges LV, editors. The handbook of research synthesis. New York: Russel Sage Foundation;1994. p.285-99. 3. Rosenthal NE, Heffernan MM. Bulimia, carbohydrate cravings, and depression: a central connection. Nutr Brain 1986;7:139-66. 4. Rosenthal NE. Winter blues: seasonal affective disorder. What it is and how to overcome it. New York: Guilford Press; 1993. 5. William JBW. A structured interview guide for the Hamilton Depression Rating Scale. Archives of General Psychiatry 1988;45:742-47.

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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.