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Exposure to Ambient Light in Patients With Winter Seasonal Affective Disorder

[Dan A Oren](#), [Douglas E Moul](#), [Paul J Schwartz](#), [Charlotte Brown](#), [et al](#). [The American Journal of Psychiatry](#). Washington: [Apr 1994](#). Vol. 151, Iss. 4; pg. 591, 3 pgs

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Abstract (Document Summary)

In a study of the quantitative relationship between ambient light and depression in winter seasonal affective disorder, 13 outpatients and 13 normal comparison subjects each wore a light monitor for 1 week. The patients and normal subjects showed similar light exposure profiles; among the patients, severity of depression was inversely related to photoperiod, and there was a trend toward a correlation between greater severity of depression and later time of onset of morning light exposure. These findings suggest that vulnerability to short photoperiods may be related to depression in winter seasonal affective disorder. [PUBLICATION ABSTRACT]

Full Text (1346 words)

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[Headnote]

In a study of the quantitative relationship between ambient light and depression in winter seasonal affective disorder, 13 outpatients and 13 normal comparison subjects each wore a light monitor for 1 week. The patients and normal subjects showed similar light exposure profiles; among the patients, severity of depression was inversely related to photoperiod, and there was a trend toward a correlation between greater severity of depression and later time of onset of morning light exposure. These findings suggest that vulnerability to short photoperiods may be related to depression in winter seasonal affective disorder.

(Am J Psychiatry 1994; 151:591-593)

There is a robust inverse correlation between photoperiod and prevalence of symptoms of winter seasonal affective disorder (1). It is unknown, however, whether seasonal affective disorder develops because of reduced exposure to light, susceptibility to light deprivation, or both. We report on the naturalistic light exposure of patients with seasonal affective disorder and normal volunteers.

METHOD

The patients were recruited through the media, were physically healthy, and met criteria for winter seasonal affective disorder (1). The comparison subjects were matched for age, gender, and, when possible, week of light monitoring. Each group comprised 11 women and two men. The patients' mean age was 38 years (SD=12), and that of the comparison subjects was also 38 years (SD=13).

Each subject wore an Actillum (Ambulatory Monitoring, Inc., Ardsley, N.Y.) with wrist and lapel light sensors to detect the brightest illuminance (2) at either sensor and to record the mean of these illuminances every 12 minutes over 1 week. Before sleeping, the subject placed the monitor at his or her bedside. After 1 week an interviewer rated each subject's mood with the Hamilton Depression Rating Scale (3). We measured medians of several light exposure variables: 1) photoperiod-length of daily exposure to light of at least 2 lux (in hours); 2) morning light-onset time-time at photoperiod onset; 3) evening dark-onset time-time at end of photoperiod; 4) total daily light exposure-sum of recorded illuminances (recorded five times per hour) divided by five (in lux-hours); 5) median light exposure-exposure during the photoperiod (in lux); and 6) peak exposure-maximum daily light exposure (in lux).

After visual inspection of the data to ensure that they met the criteria for use of parametric tests, we compared the light exposures of the patients and comparison subjects by means of analysis of variance (4) and examined the individual variables with two-tailed paired t tests or Mann-Whitney rank sums as appropriate. The latter variables were correlated with mood (in the patients) by means of the Pearson's or Spearman's test as appropriate. One comparison subject had an aberrant peak exposure at one time point, and this data point and that of the matching patient were excluded from the data analysis.

RESULTS

There were no significant differences in the date of light measurement between the patients and comparison subjects (mean, Jan. 16, 1992) or in any variable measured (table 1). The daily profiles of median light exposure showed no significant differences or interaction (figure 1).

The mean score of the patients on the Hamilton depression scale was 14 (SD=3). There was an inverse correlation between photoperiod and severity of depression ($r^{\text{sub } s^{\wedge}}=-0.56$, $p<0.05$). There was a trend toward a positive correlation between time of light onset and severity of depression ($r=0.51$, $p<0.08$, power=0.43).

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TABLE 1. Measures of Light Exposure for 13 Patients With Seasonal Affective Disorder and 13 Age- and Gender-Matched Comparison Subjects

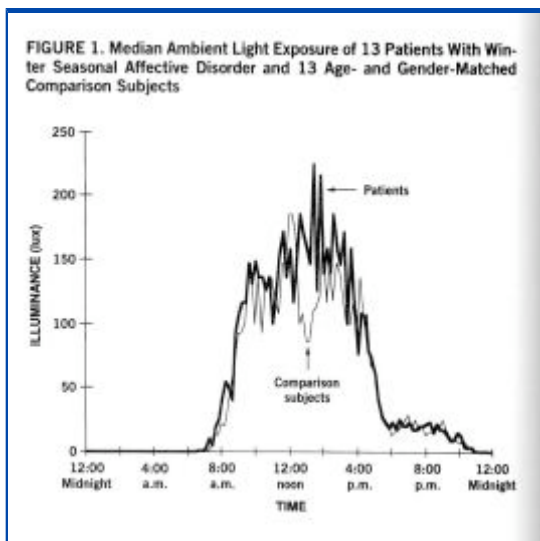
DISCUSSION

The dimly lit winter environment inhabited by patients with winter seasonal affective disorder appears similar to that of normal subjects. Given typical indoor ambient light levels below 250 lux, the daily pattern of light exposure may be dramatically affected by exposure to bright light. Although brighter light may be found outdoors, our data suggest that our subjects are exposed to relatively little outdoor light.

The inverse correlation between photoperiod and Hamilton score strengthens previous accounts suggesting that winter seasonal affective disorder may be a photoperiodic phenomenon (6). The number of subjects in this study was insufficient to determine whether time at onset of photoperiod is indeed clinically important. Nevertheless, the trend toward a correlation between later onset of photoperiod and depressed mood is consistent with the "phase-shift" hypothesis, which argues that early morning light exerts an antidepressant effect by advancing the body clock (7).

This study had other limitations. The statistical power to detect small differences in total daily light exposure might have been inadequate. Light exposure was not monitored at the same time for the patient and comparison subject in every pair. Four patients might have been "overmatched" (8), as they worked in environments perhaps too similar to allow valid inferences about environmental differences between patients with winter seasonal affective disorder and comparison subjects. Analysis of our data without the inclusion of these subjects, however, did not alter our findings.

Since naturalistic photoperiod correlated with mood, and other aspects of environmental light did not, extending the photoperiod might influence mood to a greater extent than would be predicted by the additional number of photons of light delivered. A previous test of short and long photoperiods showed no difference in efficacy (9). Limitations in that study included inadequate statistical power, use of pulsed light therapy, and too late a photoperiod onset in the long, summer photoperiod condition. Researchers have recently effectively treated seasonal affective disorder by exposing sleeping subjects to very low, gradually increasing early-morning light intensities that extended the photoperiod (10).



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FIGURE 1. Median Ambient Light Exposure of 13 Patients With Winter Seasonal Affective Disorder and 13 Age- and Gender-Matched Comparison Subjects

This study provides strong evidence that patients with winter seasonal affective disorder and matched comparison subjects inhabit a dim world in winter. This suggests that the pathophysiology of seasonal affective disorder is related to an exaggerated need for environmental light. Our data point to the potential value of further exploration of photoperiodic influences in winter seasonal affective disorder.

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