Journal of the American Academy of Child & Adolescent Psychiatry

Lippincott Williams & Wilkins

Volume 36(6) June 1997 pp 816-821

A Controlled Trial of Light Therapy for the Treatment of Pediatric Seasonal Affective Disorder

[Article]

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Accepted January 28, 1997.

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This research was supported in part by R01 MH48343 and donations from the Freund Foundation and Mr. and Mrs. Richard Simchas to Dr. Teicher. The authors thank Eric Turner, M.D., Joanna Pleeter, Chris Luetke, Ann Polcari, R.N., M.S.C.S., Cindy McGreenery, and Elizabeth Witowski for their assistance with data collection; Emily Yamada for her help with instrument development; and David Avery, M.D., for his advice regarding the use of dawn simulation. Thanks to the Sun Box Company for the loan of light boxes and to PsiSq for the donation of the dawn simulators.

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Outline

Graphics

Abstract^

Objective: To evaluate the efficacy of light therapy for the treatment of pediatric seasonal affective disorder (SAD).

Method: 28 children (aged 7 to 17 years) at two geographically distinct sites were enrolled in a double-blind, placebo-controlled, crossover trial of bright-light treatment. Subjects initially entered a week-long baseline period during which they wore dark glasses for an hour a day. They were then randomly assigned to receive either active treatment (1 hour of bright-light therapy plus 2 hours of dawn simulation) or placebo (1 hour of clear goggles plus 5 minutes of low-intensity dawn simulation) for 1 week. The treatment phase was followed by a second dark-glasses phase lasting 1 to 2 weeks. After this phase, the children received the alternate treatment. Response was measured using the parent and child versions of the Structured Interview Guide for the Hamilton Depression Rating Scale, Seasonal Affective Disorders version (SIGH-SAD).

Results: Data were analyzed as change from baseline. SIGH-SAD-P total depression scores were significantly decreased from baseline during light therapy compared with placebo (one-way analysis of variance, p = .009), and no differences were found between the placebo and control phases. Subscores of atypical and typical depression were also significantly decreased during the active treatment (p = .004 and .028, respectively). A similar trend was noted with the SIGH-SAD-C, but this did not reach significance. At the end of the study, 78% of the parents questioned and 80% of the children questioned rated light therapy as the phase during which the child "felt best."

Conclusion: Light therapy appears to be an effective treatment for pediatric SAD. J. Am. Acad. Child Adolesc. Psychiatry, 1997, 36(6):816-821.

Key Words: seasonal affective disorder, light therapy, pediatric disorders.

Winter seasonal affective disorder (SAD) is a variant of recurrent affective disorder in which mood changes and atypical vegetative symptoms regularly occur during the winter months and disappear completely during the spring and summer (Rosenthal et al., 1984) [10]. Although SAD has been well described in adults (Rosenthal, 1993) [7], less is known about the clinical presentation and treatment of children with SAD. Recent epidemiological studies suggest that winter SAD may affect as many as 3% to 4% of school-age children (Carskadon and Acebo, 1993; Swedo et al., 1995) [2,13], and symptoms seem similar to those in adults. Rosenthal and colleagues (1986) [8] described seven children who regularly experienced depressive symptoms during the winter months, particularly irritability, fatigue, sadness, sleep changes, and problems at school. After an open trial of bright-light therapy, all seven subjects experienced improvement in these symptoms, particularly school performance and mood. At 7-year follow-up, J. Giedd (written communication, 1994) found that all six of the children who could be reached still had seasonal symptoms and continued to use some form of light therapy during the winter.

Other reports suggest that pediatric SAD may be similar to the adult variant, not only in clinical presentation, but also in response to light therapy. Sonis et al. (1987) [12] compared bright-light therapy to relaxation treatment in a double-blind, controlled study of five children with SAD. They found that light therapy, but not relaxation therapy, significantly decreased the severity of the SAD symptoms. Moreover, the benefits of light therapy appeared to be fairly specific to seasonal symptoms, since four children with nonseasonal major depression and five subjects with attention deficit disorder did not show similar improvement. On the basis of the adult literature and anecdotal pediatric experiences, we predicted that light therapy would be effective in reducing the symptoms of pediatric SAD.

Because little is known about the responsiveness of pediatric SAD patients to light therapy, and because other pediatric affective disorders appear to be relatively refractory to treatment (Ryan, 1992) [11], we chose to maximize treatment effect by using both dawn simulation and afternoon bright-light therapy for the active-treatment phase. Inasmuch as both of these modalities have been reported to be effective for the treatment of adult SAD (Rosenthal, 1993; Rosenthal et al., 1984) [7,10], we reasoned that the combination would be more effective than either modality alone.

METHOD^

Study Criteria^

Eligible subjects met all DSM-III-R criteria for recurrent major depression with a winter seasonal pattern (American Psychiatric Association, 1987) [1], except that only two prior episodes of winter depression were required instead of three (in keeping with Rosenthal et al., 1986 [8]). To be accepted into the study, seasonal affective symptoms had to be present both at home and at school. Children who had a history of nonwinter depression were excluded, as were those who had had a prior trial of bright-light therapy.

Subjects^

This study was conducted over two consecutive winters at two collaborating sites, one in the Washington, D.C., metropolitan area and the other in Boston. In the Washington, D.C., area, subjects were recruited using announcements in Parent-Teacher Association and school newsletters. These announcements generated 110 telephone calls, which produced 65 completed telephone interviews. From this group, 30 children and adolescents were identified as potential subjects and came into the outpatient clinic for an evaluation. All children were seen by two mental health professionals experienced in the diagnosis of pediatric SAD, one or both of whom were physicians. Evaluations included general medical and psychiatric interviews with one (or both) parents and the child, as well as the parent and child versions of the Structured Interview Guide for the Hamilton Depression Rating Scale, Seasonal Affective Disorders version (SIGH-SAD-P and SIGH-SAD-C) (Williams et al., 1994) [16]. In addition, potential subjects completed three self-report questionnaires: the Seasonal Pattern Assessment Questionnaire (SPAQ) (Kasper et al., 1989) [4], a survey version of the SPAQ designed for children and adolescents, the Kiddie-SPAQ (Swedo et al., 1995) [13], and the Seasonal Screening Questionnaire (Rosenthal et al., 1989) [9]. These structured assessments, in combination with the semistructured clinical interview, were used to make the diagnosis of SAD in the Washington, D.C., subjects. Of those evaluated, six children were excluded from the study, one because of a prior trial of light therapy and five because their symptoms did not meet criteria for pediatric SAD. Eighteen children were enrolled, the first starting in early November and the last completing the study in mid-March, with most subjects participating during January and February. Two patients withdrew during the course of the study (one because of surgery and one to seek active treatment).

In the Boston metropolitan area, subjects were also recruited by newspaper advertisements and self-referral. These referral sources generated 25 telephone calls, which produced 20 completed telephone screenings. Of the 20 screened, 15 were identified as potential SAD cases and were evaluated. Evaluations were completed by two mental health professionals experienced in the diagnosis of pediatric SAD and consisted of thorough medical and psychiatric interviews with one or both parents, including the Schedule for Affective Disorders and Schizophrenia for School-Age Children-Epidemiologic version (a semistructured questionnaire) (Orvaschel and Puig-Antich, 1987) [6] and the SIGH-SAD-P. (The SIGH-SAD-C was not used in Boston.) Of the children evaluated, one failed to meet criteria and another declined to participate in the study in order to receive immediate, active treatment. Thus, 13 children were enrolled, the first starting the study in early December and the last finishing in early March, with most subjects participating during January and February. During the course of the study, one patient withdrew because of an extended vacation.

Study Design^

A randomized, double-blind, crossover design was used in this treatment trial. The baseline consisted of a 1-week period during which subjects wore dark glasses (neutral gray with peripheral filters, with 10% light transmittance) for 1 hour between 4 and 8 P.M. when outside and not at school. The main purpose of the dark glasses was to attempt to create a double-blind. Subjects and their parents were told that the goal of the study was to compare the effectiveness of different frequencies of light for the treatment of SAD, and as a result the child would wear different pairs of light-filtering glasses during the different phases of the study. This explanation was based on studies which have reported that certain wavelengths of light may be more effective than others for the treatment of seasonal affective symptoms (Oren et al., 1991) [5]. Subjects wore the dark glasses at the same time of day that they would later wear the clear glasses or receive the active treatment. After the baseline dark-glasses phase, subjects were randomly assigned to receive either active or placebo treatment.

Active treatment consisted of 2 hours of dawn simulation to a maximum of 250 lux at 6:30 A.M., plus 1 hour of bright-light therapy (2,500 lux for children younger than 9 years old and 10,000 lux for those aged 9 or older) between 4 and 8 P.M. The decision to use a lower light intensity for the younger children was based on theoretical concerns about exposure of the children's eyes to high-intensity light sources (G.C. Brainard, personal communication, 1992), as well as clinical data suggesting that younger children respond to shorter durations and lower intensities of light (Rosenthal et al., 1986) [8]. Subjects were instructed to sit 18 inches in front of the light box and to glance at the light frequently while they played, read, or watched television. Placebo treatment consisted of 5 minutes of dawn simulation to a maximum of 2 lux, and 1 hour wearing clear glasses while doing sedentary activities (such as reading, watching television, etc.) at the same time of day that the child had received the active treatment. As with the dark glasses worn at baseline, subjects were told that the clear glasses might affect their SAD symptoms by filtering ambient light. The purpose of this explanation was to ensure that subjects had similar expectations for improvement before entering the placebo and active-treatment phases. Children and parents filled out comparative expectation ratings before each phase of the study to test the effectiveness of this explanation.

After a week of either placebo or active treatment, subjects entered a washout period (1 to 2 weeks) when they again wore the dark glasses. By design (and in accordance with institutional review board recommendations), the washout period could be terminated after the first week if the child demonstrated significant clinical deterioration. Six (38%) of the 16 children in Washington, D.C., and 7 (58%) of the 12 children in Boston had a 1-week washout. After washout, all subjects received the alternate treatment (placebo if they had had active treatment first or active treatment if they had already received placebo.)

Ratings and Outcome Measures^

All ratings of symptom severity were obtained by separate individuals from those who provided the clinical care, to ensure that raters remained blind to treatment phase. In addition, to prevent accidental disclosure of the treatment, parents and children were specifically told not to discuss any aspect of their treatment with the raters. Ratings included a joint comparative expectations questionnaire, a side effects questionnaire, and the SIGH-SAD-C and SIGH-SAD-P. The SIGH-SAD-C and SIGH-SAD-P are modified versions of the widely used SIGH-SAD (Williams et al., 1994) [16], a semistructured interview designed to measure severity of seasonal depressive symptoms (Terman et al., 1990, 1996) [14,15]. The SIGH-SAD-C and SIGH-SAD-P are similar to the adult version, but they contain additional items to measure symptoms that are unique to children: irritability, school performance/behavior, and concentration/attention. In addition, the language of the child interview was adjusted to approximately the second- to third-grade level, with the interviewer having some discretion over the language used with younger children. Both the SIGH-SAD-C and the SIGH-SAD-P can be scored to yield a total depression score or can be broken down into subscores of atypical or typical depression (instruments available upon request from the corresponding author).

In addition to these weekly ratings, at the end of the study, parents and children at one site were also asked to rank the phases in which the child "felt best," "felt second best," or "felt worst." Discussions of treatment effect were delayed until after these rankings to prevent physician opinion from biasing the patient's responses.

Statistical Analysis^

No treatment-order effects were found at either site for any of the scales (analysis of variance [ANOVA]). However, significant site differences were found for baseline values of the SIGH-SAD-P, both for total depression scores (p = .004) and subscores of atypical and typical depression (p = .009 and .02, respectively). Therefore, subsequent statistical analyses were conducted on change scores. Scores were converted to change scores by subtracting phase scores from baseline scores for each subject. These change scores were then examined using one-way ANOVA for repeated measures with Bonferroni's post hoc testing. Additional analyses with t test and regression were used to determine whether there was any relationship between age or sex and baseline severity. All statistical analyses were done using SAS (SAS Institute, 1985) [3]. All reported p values are two-tailed.

RESULTS^

Subjects^

(Table 1) summarizes the demographic information for the subjects in the two sites. Although the proportion of females to males differed in the two samples (Boston, 5:1; D.C., 1:2), no relation was found between gender and baseline severity on the SIGH-SAD-P. Age at onset and age at time of study were not significantly different between the sites, either. A regression analysis of age and baseline SIGH-SAD-P score did not show significant differences, suggesting that symptom severity was not related to the age of the subject. To further assess the impact of age on symptom severity, the group was divided into subgroups of children younger than 12 (n = 13) and those 12 or older (n = 15). The means were then compared using a t test, and again no differences were found. A t test comparing symptom severity of males (n = 13) versus females (n = 15) using the SIGH-SAD-P also found no significant differences.

Table 1. Patient Characteristics

Seasonal affective symptoms were similar to those reported previously (Rosenthal et al., 1984, 1986) [10,8] with episodes of winter depression beginning around the end of October and extending until the end of March. The worst symptoms were noted in January.

Comorbid psychiatric diagnoses were found in 10 of 28 subjects: four children met diagnostic criteria for attention-deficit hyperactivity disorder (ADHD), two for a learning disorder, and one for both ADHD and a learning disorder; in addition, one child had a history of separation anxiety disorder and two met criteria for posttraumatic stress disorder.

Outcome^

Data from the SIGH-SAD-P and the SIGH-SAD-C were analyzed as change from baseline using a one-way ANOVA (Table 2). As predicted, SIGH-SAD-P scores were significantly decreased from baseline during active treatment compared with both placebo and washout dark-goggles phases. No differences were found between the placebo and washout phases. This result was true for total depressive scores (p = .009), as well as subscores of atypical and typical depression (p = .004 and .028, respectively). While no significant differences were found with the SIGH-SAD-

C, there was a trend toward greater improvement during active treatment than during the placebo phase (Table 2).

Table 2. Improvement From Baseline for Children Treated With Bright-Light Therapy and Placebo

Because no diagnostic cutoff scores have been developed for the SIGH-SAD-P, it was not possible to determine the rate of clinical remission during active treatment. However, 20 (71%) of 28 subjects had at least a 50% decrease of symptoms during the active treatment, whereas only 7 (25%) of 28 had such a decrease during placebo. The effectiveness of the active treatment was confirmed in a posttreatment survey of the Washington, D.C., subjects, in which 78% of the parents (11/14) and 80% of the children (12/15) rated active treatment as the one in which the child "felt best" (one child and two parents did not complete the survey).

Reported expectations for improvement were not significantly different between the phases (as measured by the comparative expectations measure), suggesting that neither the children nor their parents were biased toward active treatment.

Data on side effects of treatment were obtained using structured questionnaires. Only one or two children in each phase noted any side effect (abdominal pains, dizziness, eyestrain, fatigue, feeling "wired," headaches, insomnia, muscle aches, nausea, sweaty palms, and disturbed vision were each reported), and there were no differences across phases.

To assess compliance, parents were asked about missed treatments, difficulties with setting the dawn simulator, and their children's wearing of the prescribed goggles. All reported that their children were able to comply fully with the wearing of the special glasses and sitting in front of the light box as directed. However, two families had some difficulty with the dawn simulation device initially (one during active phase, one during placebo) and therefore were not sure whether their children had received the appropriate light exposure during the first 2 days of the week-long trial.

DISCUSSION^

The results of this placebo-controlled, double-blind, crossover trial suggest that bright-light therapy is an effective treatment for pediatric SAD. During the week of active treatment (a combination of light-box therapy and dawn simulation), the children's depressive symptoms on the SIGH-SAD-P were significantly decreased from baseline compared with both the placebo and washout phases. Scores on the SIGH-SAD-C were also decreased from baseline during active treatment, though this difference was not significant (perhaps because of the smaller sample size). Active treatment was not associated with a higher frequency of side effects than placebo, and it appeared to be well tolerated. The clinical responses of the children and their parents are perhaps of even greater importance than these statistical results, and in the posttreatment survey, the vast majority of the parents and children rated the active-treatment week as the phase during which they "felt best." Moreover, nearly all of the children at both sites continued to use bright-light therapy after the study had finished.

The following case is illustrative of the children's response to the light therapy trial: S.J., a 15-year-old female 10th-grader, reported a history of two major depressive episodes with seasonal variation beginning at age 12. Onset of her depressive symptoms typically began in late October and remission occurred in early to mid-April. At the time of the study, she described a moderate degree of depressed mood and irritability, increased appetite with a particular penchant for carbohydrates and sweets, a 3-hour/day increase in sleep duration, feeling fatigued throughout the day most days, and a moderate decrease in mood and energy in the late afternoons. Her baseline SIGH-SAD score was

32.

S.J. was randomly assigned to receive active treatment first. She responded with a dramatic reduction in symptoms, reporting that only a mild hyperphagia, slight fatigue, and a 2-hour increase in sleep remained. Her SIGH-SAD score had decreased to 6. She remarked, "It was like I was my old-self again-like I am in the summer. I felt like going out and doing fun things." After a 1-week washout, S.J.'s symptoms had returned (SIGH-SAD score = 23) and remained consistently worse during the placebo phase (SIGH-SAD score = 22.)

Both S.J. and her parent decided that she should continue the light therapy. They purchased a 10,000 lux light box. With daily light therapy, S.J. remained in remission throughout the remainder of the season. In contrast to prior years, she maintained an active social life and consistently good grades. She even researched the literature on SAD and presented a paper at her high school's science fair. She has continued light therapy each winter since her participation in the study and is now using her treatment during her freshman year in college.

As with all investigations, there are some limitations to these findings. First and foremost is the issue of the validity of pediatric SAD as a diagnosis. Although in the literature there are several reports of children with seasonal affective symptoms, the diagnosis of pediatric SAD has yet to be well established. In this study, all subjects were seen by a nurse or physician experienced in the diagnosis of childhood depression and all met criteria for major depressive disorder of a seasonal affective type. However, it is possible that some children may have had depressive symptoms that coincidentally worsened in the winter, in which case their disorder may have been misdiagnosed as SAD. The lack of summer symptoms in these children and their differential response to light therapy would speak against this.

The brevity of the treatment limits the generalizability of these findings. Although subjects improved significantly during the week of active treatment, no systematic information is available regarding their response to long-term treatment. For those subjects from whom follow-up information was received, light therapy continued to be of benefit. This is in keeping with a follow-up study by Giedd et al. (1994, written communication) in which six children with SAD sustained positive effects of light therapy over a 7-year period. Future studies could include follow-up data or could use a parallel design to determine whether the improvement produced by the light therapy is long-lasting. In addition, the use of both dawn simulation and light-box therapy complicates the results because it is possible that either treatment might not be effective if used alone. Further studies will be needed to determine the differential efficacy of these two therapies.

These preliminary findings are strengthened by the fact that they were internally replicated at two geographically distinct sites (Boston and Washington, D.C.). At both sites, active treatment was superior to placebo treatment and patients demonstrated significant improvement from baseline. This is the first systematic controlled study to find significant improvement of seasonal affective symptoms in children using bright-light therapy. With new studies (Carskadon and Acebo, 1993; Swedo et al., 1995) [2,13] reporting that the prevalence of pediatric SAD may be as high as 3% to 4%, there is clearly a need for effective treatment for this troublesome condition. The findings of this study require amplification and replication, but they suggest that bright-light therapy is an effective treatment for pediatric SAD.

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Accession Number: 00004583-199706000-00019
