Parental Reports of Seasonal Mood and Behavior Changes in Children

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Abstract. Objective: The chief purpose of this study was to investigate the nature and prevalence of children's seasonal symptoms. Method: Parental reports of seasonal changes in six mood or behavioral symptoms (sleeping, eating, irritability, energy, withdrawal, and sadness) were surveyed for children living across the United States. The sample included 892 girls (mean age = 10.5 ± 1.0 years) and 788 boys (mean age = 10.6 ± 0.9 years), with a response rate of 46% for girls' parents and 39% for boys' parents. Results: At least one winter recurring symptom was reported in 48.5% of children, as compared with 9.1% in fall and 10.8% in spring. Winter symptoms were reported equally in girls and boys with one exception ("is tired"); age effects were found for three symptoms only in girls ("sleeps more," "is tired," and "withdraws"). Regional effects showed more winter symptoms reports in northern zones than in southern zones. Conclusions: Given the potential therapeutic benefit of light therapy in children with such seasonal patterns, careful assessment of seasonality is merited for children with winter mood and behavior problems. *J. Am. Acad. Child Adolesc. Psychiatry,* 1993, 32, 2:264–269. **Key Words:** children, seasonal affective disorder, winter depression, mood, behavior, sleep, latitude.

Winter depression or seasonal affective disorder (SAD) was first well characterized by Rosenthal and colleagues (Rosenthal et al., 1984) in a group of 29 adult patients. A broad body of information describing the disorder has subsequently been accumulated from clinical and epidemiological studies of SAD in adults leading to the inclusion of seasonal subtypes for affective disorders in *DSM-III-R*. The symptoms of winter seasonal affective disorder include both vegetative and mood disturbances. A subsyndromal variant has also been described (Kasper et al., 1989a), as have mild seasonal mood changes in normal, noncomplaining populations (Kasper et al., 1989b). In general, adults with winter SAD are described as suffering from the following symptoms from autumn through winter months with spring/summer remission: irritability, sadness, anxiety, decreased physical activity, appetite changes (most often increased), carbohydrate craving, weight changes (most often increased), increased sleep time with earlier sleep onset and later awakening, daytime sleepiness, decreased libido, work difficulties, menstrual-related depressed mood, and interpersonal difficulties (Rosenthal et al., 1984).

Epidemiological data indicate that winter depression in adults is more common in women than men, with ratios on the order of 3:1 or 6:1 (Kasper et al., 1989b; Rosenthal et al., 1984; White et al., 1990). A significantly higher incidence of SAD has been reported in young adult females than in older women or men at any age (Kasper et al., 1989b). Significantly, although mean age of onset is often reported in the third decade (Rosenthal et al., 1984), a large proportion of patients report onset in childhood or adolescence (Sonis et al., 1987). Several investigators have also reported an increased incidence of SAD in more northerly regions of the northern hemisphere (Lingjaerde et al., 1986; Potkin et al., 1986; Rosen et al., 1990), leading to the suggestion that a shortened photoperiod may be causally related to the disorder (Eastman, 1990). Light therapy has been most commonly applied to treat winter depression (Avery et al., 1991; Kripke et al., 1992; Lewy et al., 1988; Rosenthal et al., 1985; Rosenthal and Wehr, 1992; Terman et al., 1989), although other treatment modalities have also been useful, including antidepressant medication (Teicher and Glod, 1990) and D-fenfluramine (O'Rourke et al., 1989), although not melatonin (Wirz-Justice et al., 1990).

Childhood and adolescent patients with SAD have been rarely studied. Patients under age 19 have been described in four small studies, including a total of 14 patients (Mghir and Vincent, 1991; Rosenthal et al., 1986; Sonis et al., 1987; Teicher and Glod, 1990). Rosenthal's report, for example, included four boys and three girls with a mean age of 12.3 (SD = 3.4) years. The duration of illness in this group was 5.1 (SD = 1) years. These patients experienced winter mood changes lasting 2 weeks or longer along with three or more additional symptoms of fatigue, sleep changes, appetite changes, carbohydrate craving, or headaches, as well as school problems or social withdrawal. Parental ratings of symptom severity revealed the following rank order (most to least problematic): "irritability, fatigue, school difficulties, sadness, sleep changes (usually difficulty waking up in the morning), headaches, changes in appetite (usually increased), carbohydrate craving, decreased activity, crying spells, anxiety, social withdrawal, and temper tantrums" (Rosenthal et al., 1986). In three studies, light therapy was found beneficial in treating these children and adolescents

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(Mghir and Vincent, 1991; Rosenthal et al., 1986; Sonis et al., 1987); the fourth showed an equivocal response to light and to alprazolam in one 16-year-old boy (Teicher and Glod, 1990).

These few cases, along with retrospective data from adult patients, indicate that SAD occurs in children and adolescents, though the prevalence is not known. Rosenthal et al. (1986) suggest that the disorder may be milder and more amenable to treatment in children than in adults. The present study is an initial attempt to investigate the nature and prevalence of children's seasonal symptoms through a survey of parental reports of seasonal mood and behavior changes in children living across the United States.

Method

This study was part of a larger project involving children in fourth, fifth, and sixth grades. Teachers were recruited to take part in the project through a letter in the teacher's issue of *SuperScience Blue*, a science magazine for grades 4, 5, and 6. Survey packets were sent on March 11, 1991, to primary school science teachers in 78 schools across the U.S.A. who agreed to participate after receiving preliminary copies of survey forms and obtaining permission from local school administrators. The packets included a 6-page form for children (separate forms for boys and girls), a 2-page survey about the child for the parents to complete, two 3-page forms for parents (one each) to complete about their own sleep, a 5-item questionnaire for the teacher to complete about the child, and a letter to parents, all in a pre-addressed postage-paid envelope. Each child completed his or her own form as a classroom exercise and then sealed the form, returned it to the envelope, and took the envelope home. The parents' letter informed them about the research project, requested that they complete the forms about their child and themselves, and asked them to mail in the forms as an indication of their consent to include the surveys in the research project. Data from parent forms were linked to the child's data through an identification code number common to all the forms in a child's envelope. Surveys were not used for this analysis if they were completed after April 5, 1991.

Among the diversity of items included on these questionnaires was a set of questions for the parents to complete regarding the child's seasonal variations, taken roughly from the Seasonal Pattern Assessment Questionnaire or SPAQ (Rosenthal et al., 1987) (Appendix). Parents could endorse seasonal changes for fall (September/October/November), winter (December/January/February), spring (March/April/May), or "No difference across seasons." Summer was not included as an option, because it was felt that behavioral and mood changes in summer months might be more related to the summertime school recess than to possible geophysical seasonal changes. No severity measure was included in the scale. Variables derived from this set of questions included: number of positive responses endorsed by season for each of the six symptoms and total number of symptoms endorsed by season. When considered as a scale, the Cronbach's alpha value was 0.67, which indicates that these six items show moderate reliability in measuring the same construct (Cronbach, 1951).

Subjects for this analysis included students whose parents returned the questionnaire about the student: 892 girls (mean age = 10.5 ± 1.0 years) and 788 boys (mean age = 10.6 ± 0.9 years). The return rate for surveys sent to parents was 46% for parents of girls and 39% of parents of boys. The children were predominantly Caucasian (85.4%) and lived in single houses (86.2%) in areas with populations of 10,000 to 50,000 people (80.2%). In most instances, mothers completed the survey (79%), but in some cases both parents competed the form together (10.2%), or the father alone (9.5%), or another adult guardian was the respondent (1.3%).

Latitude was determined based upon the zip code for the child's school. Centroid latitude for the zip code was obtained from a computerized data base (Atlas MapMaker, Strategic Mapping, Inc.). Figure 1 shows the geographic distribution of the schools included in this sample. The data set was categorized into three zones: northern included children in schools located at or north of 42° N (N = 508); southern included those at or south of 36° N (N = 350); and a central zone lay between these two latitudes (N = 822).

The data analyzed from the questionnaires were frequency of response of parents to particular symptoms based upon seasonal categories; frequency distributions were analyzed using chi-square to evaluate differences in reported symptom frequencies as a function of sex, age, and latitude categories. Analyses undertaken with 1 degree of freedom were subjected to the Yates correction for continuity (Yates, 1934).

Results

Figure 2 illustrates the distribution of symptoms endorsed by parents as a function of season. Chi-square analyses indicated that each symptom was reported significantly more often in winter than in fall or spring ($p < 0.001$). Overall, parents of 48.5% of children reported at least one symptom as recurring in winter, as compared with 9.1% in fall and 10.8% in spring. Because of this overwhelming seasonal

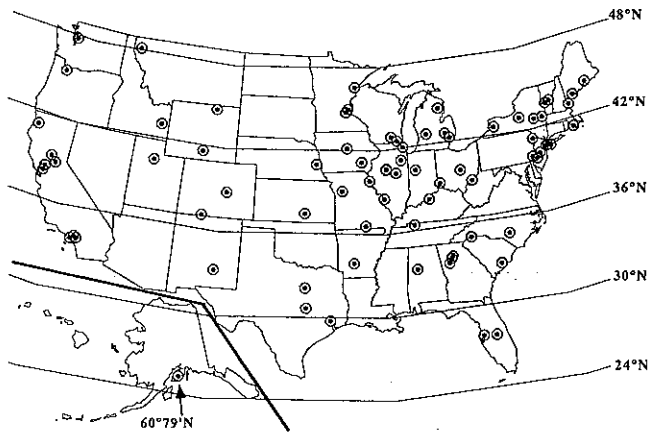

FIG. 1. The geographic distribution of schools participating in the project is shown in this figure. Each circle represents one school. The geographic zones are based upon latitude, with latitudes 42° N and 36° N separating the northern, central, and southern zones. One school was located in Alaska, none was in Hawaii.

pattern, subsequent analyses focus primarily on winter reports. Among the winter reports, "eats more" was given most often (24.6%), followed in order by "sleeps more" (23.7%), "more tired" (23.0%), "irritable" (14.9%), "seems sad" (6.4%), and "withdraws from family and friends" (3.0%).

Table 1 lists the frequency distribution by age and sex for each winter symptom. An overall sex difference was found only for the report of tiredness and lack of energy (χ^2 = 10.26, df = 1, $p < 0.005$), which was more common in girls (26.2%) than in boys (19.4%). As for age groups, the only significant differences for individual winter symptom reports were found in the girls. Increased sleep was reported significantly less frequently in 9-year-old girls (12.7%) than in the older girls (χ^2 = 10.35, df = 3, $p < 0.02$). Similarly, parents reported less often that 9-year-old girls (17.8%) were more tired and with lower energy than were the older girls (χ^2 = 8.20 df = 3, $p < 0.05$). Although the frequency of reports of "withdraws" was very low, 9- and 10-year-old girls had significantly fewer reports than 11- and 12-years-old girls (χ^2 = 7.60, df = 2, $p < 0.05$). No age-related differences in the frequency of winter symptom reports were found for boys.

Table 2 gives the age-by-sex distribution showing how many winter symptoms parents endorsed for their children. There were no sex differences in total winter symptom reports. Age analyses showed a significantly greater number of 9-year-old girls with no winter symptoms (61.3%) as compared with older girls (χ^2 = 16.94, df = 9, $p < 0.05$). No significant age difference was found for boys.

In Figure 3, the distribution of winter symptom reports is illustrated based upon geographic region, showing a significantly reduced number of symptoms reported in the south zone versus central and north (χ^2 = 36.91, df = 4, $p < 0.001$). The return rate for the survey was lower for the southern zone (38%) than for the central (46%) or northern (51%) zones. Furthermore, the age distribution of the sample was not uniform across latitude regions: significantly more younger children lived in the south, (χ^2 = 74.11, df = 6, $p < 0.001$). Thus, for example, 65% of the children from the southern region were ages 9 and 10 years, whereas 61% of the north region children were ages 11 and 12. Nevertheless, when examined within each age group, the winter symptom distribution across latitudes was similar, achieving statistical significance in all but the 12-year-old group. Thus, in all but the 12-year-old group, symptoms were reported with greater frequency in the northern and central zones than in the southern zone (age 9 χ^2 = 14.75, df = 4, $p < 0.01$; age 10 χ^2 = 11.31, df = 4, $p < 0.05$; age 11 χ^2 = 16.09, df = 4, $p < 0.01$; age 12 χ^2 = 3.58, df = 4, NS). One other regional effect was noted: parents in the south were somewhat more likely to report spring seasonal symptoms (15%) than were parents in the two more northern regions (8.9% in central and 11.1% in north; χ^2 = 9.78, df = 4, $p < 0.05$).

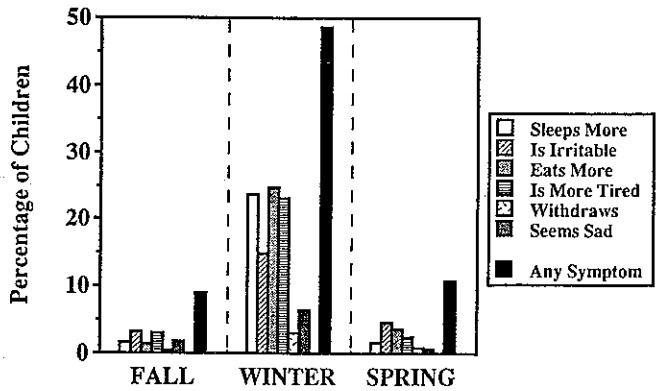

FIG. 2. Seasonal reports of six symptoms are illustrated in this figure. The inset designates bar codes. Each of the symptoms was endorsed significantly more often in the winter than in fall or spring.

In order to identify a group of children in whom a clinically significant winter mood syndrome may be present, a SAD score was developed to describe all children whose parents indicated that their child "seems sad" in the winter season along with at least two of the other symptoms. Seventy children (4.2% of the entire sample) were identified using this strategy, 38 boys and 32 girls, mean age 10.6 (SD = 0.9) years. For reference, this group included 2.9% of 9-year-old children, 4.2% of age 10, 4.7% of age 11, and 4.0% of age 12. The distribution of this group slightly favored boys over girls (4.8% of boys versus 3.6% of girls). Of the children living in the south, 3.2% were in this winter SAD group, versus 4.8% of the central and 4.2% of the northern zones. When the symptoms auxiliary to "seems sad" were examined, the most frequent report was "more tired" (81.4%), followed by "eats more" (58.6%), "sleeps more" (55.7%), "irritable" (51.4%), and "withdraws" (40.0%).

Although the report of "withdraws from family and friends" received the lowest rate of report by the parents in this study, this response on its own showed the greatest comorbidity with other symptoms. In addition, a sizable group of children was reported to sleep more and to appear more tired and lacking energy in the winter months; parents of 190 children (11.3%) reported this pair of symptoms, making it the most common association in this sample.

Discussion

This study did not use a random sampling method to identify the survey cases. Children were selected based first upon teachers identifying their classes as candidates for the project and then upon the parents opting to complete and return the survey. Thus, the subjects form a group that is mostly Caucasian, largely from medium-sized towns or small cities, and with parents and teachers who are actively involved in the child's education. Nevertheless, the geographic diversity of this sample, as well as a lack of focus on seasonal mood for the overall project, make it a useful group for an initial assessment of seasonal variability in children.

The parental report data in this survey support the assumption that seasonal changes in behavior and mood are present in a large number of youngsters. Nearly 50% of the children, for example, received a report of at least one winter symptom. Clinically relevant symptomatology likely occurs in a far smaller proportion. Our estimate, based on children with a report of "seems sad" plus at least two other winter

TABLE 1. *Individual Symptoms Endorsed for Winter by Age and Sex*

	9		10		11		12		All Girls/Boys	
Symptom	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%
Girls' age groups (N = 854)										
Sleeps more[a]	17	12.7	65	23.4	75	25.8	40	26.5	197	23.1
Irritable and touchy	18	13.3	44	15.7	43	14.8	32	21.3	137	16.0
Eats more and gains weight	23	17.0	73	26.1	79	27.2	42	27.8	217	25.4
More tired and lower energy[a,b]	24	17.8	68	24.1	88	30.1	44	29.3	224	26.1
Withdraws from family and friends[a]	1	0.7	5	1.8	14	4.8	7	4.6	27	3.2
Seems sad	6	4.4	17	6.1	19	6.6	9	6.0	51	6.0
Boys' age groups (N = 768)										
Sleeps more	22	23.7	59	21.7	70	26.8	36	25.4	187	24.3
Irritable and touchy	12	12.9	33	12.3	39	15.2	19	13.4	103	13.6
Eats more and gains weight	14	14.7	67	24.7	65	25.2	36	25.7	182	23.8
More tired and lower energy[b]	12	13.0	50	18.7	61	23.6	26	18.4	149	19.6
Withdraws from family and friends	3	3.3	9	3.3	7	2.7	3	2.1	22	2.9
Seems sad	6	6.5	21	7.8	15	5.8	10	7.1	52	6.8

[a] Significant age difference was found in winter reports of this symptom.
[b] Significant sex difference was found in winter reports of this symptom.

TABLE 2. *Number of Symptoms Endorsed for Winter of Children by Sex and Age*

	Number of Symptoms													
	0		1		2		3		4		5		5	
Age Group	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Girls														
9[a]	84	61.0	27	19.7	17	12.4	8	5.8	1	0.7	0	0.0	0	0.0
10	139	49.1	65	23.0	40	14.1	32	11.3	5	1.8	1	0.4	1	0.4
11	138	47.1	58	19.8	52	17.8	30	10.2	9	3.1	6	2.0	0	0.0
12	70	46.0	27	17.8	26	17.1	21	13.8	8	5.3	0	0.0	0	0.0
All girls	431	49.8	177	20.5	135	15.6	91	10.5	23	2.7	7	0.8	1	0.1
Boys														
9	60	63.2	15	15.8	11	11.6	7	7.4	0	0.0	1	1.0	1	1.0
10	148	54.0	62	22.6	34	12.4	18	6.8	7	2.6	3	1.1	2	0.7
11	134	51.2	53	20.2	38	14.5	23	8.8	12	4.6	1	0.4	1	0.4
12	71	50.0	36	25.4	19	13.4	11	7.8	2	1.4	3	2.1	0	0.0
All boys	413	53.4	166	21.5	102	13.2	59	7.6	21	2.7	8	1.0	4	0.5
All	844	51.5	343	20.9	237	14.5	150	9.2	44	2.7	15	0.9	5	0.3

[a] A significant age difference was found in girls.

symptoms, is slightly more than 4%. The results also demonstrate a number of factors in common with descriptions of adult seasonal depression and others that are at odds with the findings from most adult samples.

Most notably, reports of winter changes in mood and behavior in children far overshadowed fall and spring reports, as is also the case in adult seasonal mood changes (Kasper et al., 1989b; Rosen et al., 1990). One might legitimately inquire whether the timing of the survey administration was likely to have influenced the seasonal distribution of symptom reports. Kasper et al. (1989b) suggest that seasonal symptom reports are more likely to be skewed in favor of the season in which the person is interviewed. If the time of administration were influential, therefore, one would expect spring reports rather than winter or fall to be favored. It is unlikely, therefore, that the timing of the survey administration affected the seasonality of reports in the present study.

The sex distribution of winter seasonal mood and behavior changes in the children was quite dissimilar to that reported for adults, where women are three to six times more likely than men to have winter depression (Kasper et al., 1989b; Rosenthal et al., 1984; White et al., 1990). The sex distribution in the children was closer to 50:50, except for one symptom that showed a significantly higher prevalence in girls than boys ("is more tired and has lower energy"). Even in this case, however, the female:male ratio was less than 2:1. Surveys were completed by the parent rather than the child; thus, it is possible that a sex difference was not apparent in the children because the sex of the respondent was female in approximately 90% of the cases. That is, if the differential sex distribution found in adult seasonal

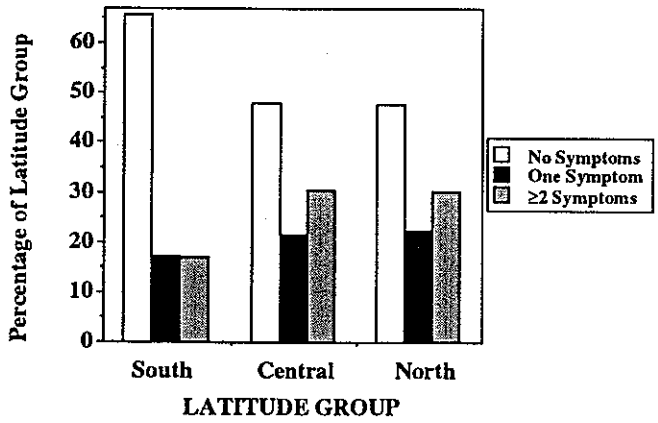

FIG. 3. Winter symptom reports are shown as a function of latitude region (see Figure 1 for regions). Open bars represent the percentage of children at each latitude for whom parents reported no winter symptoms, blackened bars are the percentage with 1 winter symptom reported, gray bars are those with 2 or more symptoms. These data illustrate a statistically significant increase in winter season symptoms in the central and north zones versus the south ($\chi^2 = 36.91$, $df = 4$, $p < 0.001$).

depression is due to greater sensitivity to seasonal changes in women than men, then the lack of a sex difference in the present data may be an artifact of the respondents' sex. Nevertheless, the results may also reflect a true absence of differential sex effects. Another caveat with regard to respondents' influence on the survey outcome has to do with whether parents may project their own seasonal patterns on their children. Thus, do mothers who suffer from SAD report similar traits in their children? Data addressing this concern are not currently available, though future assessments may help to elucidate the issue.

The majority of children in this sample were prepubertal, as judged by a self-administered physical development scale (Carskadon and Acebo, in press). Thus, if physiological changes associated with pubertal development are related to adult male/female differences in seasonal affect, then such differences would be difficult to identify in the largely prepubertal current sample. The number of late-and postpubescent children in this study was too small to evaluate this hypothesis (16% of girls and 4.3% of boys). Several lines of evidence point to the possibility that endocrine influences may affect the prevalence of affective disorders, notably the association of depression with the premenstrual syndrome and the postpartum period (Kasper et al., 1989b). The only inkling of such a possible hormonal relationship in the present data is the finding that age-related differences occurred in girls, with the older (possibly more mature) girls evidencing more symptoms than the younger girls. Thus, the relationship of puberty to winter depression merits further study.

Although recognition of a seasonal influence on affective disorder has a long history (Wehr and Rosenthal, 1989), the role of seasonality in human behavior and mood is not well studied or understood. Seasonal alterations in physiology and behavior are ubiquitous biobehavioral phenomena that may serve regulatory functions. Thus many animals, for example, exhibit seasonal patterns in feeding, weight gain or weight loss, sexual activity, and overall activity level that anticipate environmental changes and maximize energy utilization (Moore-Ede, 1986). The psychological and behavioral changes accompanying seasonal mood changes in humans may mirror such cyclic patterns in neurobiological regulation, perhaps through similar autonomic pathways—the hypothalamic-pituitary-adrenal axis and the hypothalamic-pituitary-thyroid axis (Bray, 1986)—subserving the homeostatic balance. The success of bright-light therapy for treating extreme and dysfunctional seasonal mood alterations may result from its impact upon these systems. The lack of a male/female difference in incidence of seasonal mood changes in the present sample may also relate to such biological mechanisms. If seasonal mood changes arise from such seasonal homeostatic processes, then an increase in severity and a sex-linked incidence of seasonal mood disorders postpubertally may be associated with a link between seasonal changes and facilitation of reproductive and parenting behaviors.

The relationship to latitude of winter mood and behavior change reports in the children followed a pattern similar to that reported for adults (Lingjaerde et al., 1986; Potkin et al., 1986; Rosen et al., 1990). Thus, the prevalence of winter symptomatology was significantly reduced in the southern as compared to northern and central areas. Similar rates of symptoms were reported for the central and northern zones; thus, a linear relationship with latitude was not found. Although the southern group of children was younger than the children from the northern zones, this age difference did not account for the regional differences in seasonal reports, which were statistically significant in 9-, 10-, and 11-year-old children. The reversed pattern of spring symptoms by geographic zone also paralleled findings in adults (Rosen et al., 1990). The return rate for the surveys was lower for the southern than for the northern and central areas, a difference that may have affected the latitude analysis if parents whose children showed winter changes preferentially did not return surveys. We have no reason to suspect that this happened or to test that it did not.

Using a seasonal score that required the "seems sad" item plus two others, an overall prevalence rate of 4.2% was found for winter depression in this sample of children, which is roughly comparable with that found in adult samples by Kasper and colleagues (4.3%) in Montgomery County, Maryland, and by Rosen et al. (5.5%) in four eastern communities (Kasper et al., 1989b; Rosen et al., 1990). These adult studies used a SAD cutoff established on the SPAQ survey form that seems fairly well able to identify clinically significant problems (Rosenthal et al., 1987). Whether the group of 70 children identified in this sample truly have a clinically significant disorder is not known; however, it is possible that teacher ratings (not yet linked to the data set) or other outcome measures may demonstrate additional problems in this subsample. A broader definition of winter depression requiring any three symptoms resulted in an overall prevalence in the children of 13.1%.

According to Rosenthal et al. (1986), children with winter depression may not present with mood disturbance so much as fatigue and school problems. Certainly, the combination

of "hypersomnolence" (i.e., "sleeps more") and "fatigue" (i.e., "is more tired and has lower energy") was the most common dual report in the present study. It is important to recognize, however, that both studies relied on parental rather than child report. Thus, while these symptoms may be easiest for parents to identify, the children themselves may emphasize other features. From another point of view, it is possible that some of what parents report represents cumulative effects of insufficient sleep in children. Previous reports have shown that adolescents with insufficient sleep may experience greater difficulty waking in the morning ("sleeps more") and excessive sleepiness ("is more tired") (Carskadon, 1990). The seasonality of such a pattern, however, has not been established. Finally, these parental reports of seasonal changes may identify a seasonal sleep disorder rather than a seasonal mood disorder. It is difficult to determine whether sleep or mood is the primary component of winter depression.

In conclusion, seasonal changes in mood and behavior, particularly in the wintertime, are commonly reported in children aged 9 to 12 years. Using a single behavior change as a benchmark, 48% of children show such a seasonal pattern. It is unlikely, however, that a single symptom is a cause for great concern in most families. The presence of three symptoms, on the other hand, may represent a disruptive pattern for certain children and was found in 13% (any three symptoms) or 4.2% ("seems sad" plus two others) of the present sample. Given the potential therapeutic benefit of light therapy in children with such seasonal patterns, a careful assessment of seasonality is merited when evaluating children who present with mood and behavior problems in the winter. A word of caution is required, however, because adequate testing of light therapy in children has not yet been done.

Appendix

Seasonal Mood and Behavior Items from Parent Survey

Some children show changes in their behavior during the school year as the seasons change. Mark below if you have noticed clear-cut changes in your child's behavior related to seasons *for at least 2 years.*

My child sleeps more in this season.
My child is irritable and touchy in this season.
My child eats more and gains weight in this season.
My child is more tired and has lower energy in this season.
My child withdraws from family and friends in this season.
My child seems sad in this season.

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