

The Diagnosis, Symptomatology, and Epidemiology of Seasonal Affective Disorder

By Andres Magnusson, MD, PhD, and Timo Partonen, MD, PhD

FOCUS POINTS

- Most seasonal affective disorder (SAD) patients tend to sleep longer during their depressive episodes.
- Most SAD patients have increased appetite when depressed, and they especially crave for sweets or carbohydrate rich food.
- Depressive symptoms tend to remit when the patients are exposed to natural daylight or artificial bright light.
- While SAD is a common condition, it is more common in women and young adults.

ABSTRACT

The operational criteria for seasonal affective disorder (SAD) have undergone several changes since first proposed in 1984. SAD is currently included as a specifier of either bipolar or recurrent major depressive disorder in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. The International Classification of Diseases, Tenth Edition has provisional diagnostic criteria for SAD. The most characteristic quality of SAD is that the symptoms usually present during winter and remit in the spring. Furthermore, the symptoms tend to remit when the patients are exposed to daylight or bright light therapy. The cognitive and emotional symptoms are as in other types of depression but the vegetative symptoms are the reverse of classic depressive vegetative symptoms, namely increased sleep and increased appetite. SAD is a common condition, but the exact prevalence rates vary between different studies and countries and is consistently found to be more common in women and in youth. SAD probably possibly occurs in children although not as commonly as in young adults. Some studies have found that certain ethnic groups who live at high northern latitudes may have adapted to the long arctic winter.

CNS Spectr. 2005;10(8):625-634

INTRODUCTION

A discussion of the various aspects of the clinical presentation and epidemiology of SAD follows. Studies on the prevalence of SAD in general populations are reviewed; these studies have usually employed the Seasonal Pattern Assessment Questionnaire (SPAQ).¹ Other types of studies on seasonal variation in mood are then reviewed. Next, studies of SAD in specific segments of the population, such as children, adolescents, and ethnic groups, are discussed. Finally, the association between prevalence of SAD and latitude is reviewed.

DIAGNOSIS OF SEASONAL AFFECTIVE DISORDER

SAD was originally defined as a syndrome in which depression developed during autumn or winter and remitted the following spring or summer, occurring for at least 2 successive years.² In addition, the SAD patient had to have a history of major depressive or bipolar disorders. Since then, two subtypes of SAD have been described in the literature:³ winter SAD and summer SAD, of which the former is far more frequent. (Heretofore, when SAD is not further specified, it refers to winter SAD.) Subsyndromal SAD is a condition with similar but milder symptoms that do not impair functioning to a major degree (Table 1).⁴ The tendency to experience seasonal changes in mood and behavior, also known as seasonality, is manifested to a different degree in individuals, ranging from the extreme and pathological end of the spectrum, namely patients with SAD, through the mildly pathological, as in subsyndromal SAD, to the normal.

The original conceptualizations of SAD were eventually transformed into diagnostic criteria based on the *Diagnostic and Statistical Manual of Mental Disorders (DSM)*⁵ and were first published in 1987 in *DSM-III-R*. In the latest version of this series of clas-

Dr. Magnusson is a professor in the Department of Psychiatry at Aker University Hospital in Oslo, Norway. Dr. Partonen is academy research fellow in the Department of Mental Health and Alcohol Research at the National Public Health Institute in Helsinki, Finland.

Disclosure: Dr. Magnusson was an investigator in a pharmacologic study supported by Servier. Dr. Partonen does not have an affiliation with or financial interest in any organization that might pose a conflict of interest. This article was submitted on March 7, 2005, and accepted on April 26, 2005.

Please direct all correspondence to: Andres Magnusson, MD, PhD, Aker University Hospital, Department of Psychiatry, Trondheimsveien 235, 0514 Oslo, Norway; E-mail: andres.magnusson@medisin.uio.no.

sifications *DSM-IV*,⁶ SAD is regarded as a specifier of either bipolar or recurrent major depressive disorder, with a seasonal pattern of major depressive episodes (codes 296.3x to 296.8x [Table 2]).

The *International Classification of Diseases, Tenth Edition (ICD-10)*⁷ gives only provisional diagnostic criteria for SAD. SAD is defined as a form of bipolar affective or recurrent depressive disorder, with episodes varying in degrees of severity.

SYMPTOMS

In addition to depressed mood, many patients develop so-called atypical depressive symptoms (increased duration of sleep, increased appetite, weight gain, and carbohydrate craving) that are, in fact, common in SAD (Table 4).⁸⁻¹⁰ A characteristic of interest is the response to light exposure in the patient's history. This might manifest as mood improvement when travelling to different regions during the winter, when living at different latitudes, when living or working in homes or offices with different levels of illumination, or as reactions to spells of poor weather conditions reducing the hours of sunshine plus levels

of daylight even during the summertime. For example, 94% of patients have reported that travel to latitudes nearer the equator resulted in remission or at least a marked decrease of their symptoms.

Atypical depressive symptoms frequently precede the impaired functioning.¹¹ A minority of patients report reduced appetite, reduced sleep length, and weight loss, symptoms then are more typical for other, more common types of depression. In addition to these vegetative symptoms, patients may suffer from general symptoms of depression including diminished pleasure or interest in things, psychomotor agitation or retardation, fatigue or loss of energy, feelings of worthlessness, or excessive or inappropriate guilt, diminished ability to think or concentrate, or indecisiveness, and recurrent thoughts of death. A somatic symptom such as pain is often the presenting complaint at visits to general practice.

Despite the presence of physical symptoms, medical examination and laboratory studies are routinely normal in SAD. Therefore, the diagnosis rests on the patient's history. Patients with SAD tend to have less frequent suicidal ideation and morning worsening of mood than those with non-seasonal affective disorder.¹² A family history of mood disorders, alcohol-related disorders, and SAD itself is common in the first-degree relatives of the patients.^{12,13} SAD is also

TABLE 1. OPERATIONAL CRITERIA FOR SUBSYNDROMAL SEASONAL AFFECTIVE DISORDER⁴

- A history of some difficulty during the winter months that have occurred on a regular basis (at least 2 consecutive winters) and have lasted for a sustained period of time (≤4 weeks). Example: decreased energy; decreased efficiency at work (concentration, completing tasks); decreased creativity or interest in socializing; and change in eating habit (eating more carbohydrates); weight (gaining weight); or sleep patterns (more sleep)
- Subjects have to regard themselves as normal, not suffering from an illness or a disorder
- Subjects have not sought medical or psychological help specifically for the above difficulties, nor has anyone else suggested that they should do so
- People who do not know them well do not recognize that they have a problem, or if they do, easily attribute it to circumstances such as “flu” or “overwork”
- The symptoms experienced by the subjects have not disrupted their functioning to a major degree. Example: calling in sick several times per winter, or severe marital discord
- No history of major affective disorder in winter
- No serious medical illness

Kasper S, Rogers SL, Yancey A, Schulz PM, Skwerer RG, Rosenthal NE. Phototherapy in individuals with and without subsyndromal seasonal affective disorder. *Arch Gen Psychiatry*. 1989;46:837-844.

Magnusson A, Partonen T. *CNS Spectr*. Vol 10, No 8. 2005.

TABLE 2. DIAGNOSTIC CRITERIA FOR THE SEASONAL PATTERN SPECIFIER OF MOOD DISORDERS⁶

- There has been a regular temporal relationship between the onset of major depressive episodes in bipolar I or bipolar II disorder or major depressive disorder, recurrent, and a particular time of the year (for example, regular appearance of the major depressive episode in the autumn or winter). Note: Do not include cases in which there is an obvious effect of seasonal-related psychosocial stressors (for example, regularly being unemployed every winter).
- Full remissions (or a change from depression to mania or hypomania) also occur at a characteristic time of the year (for example, depression disappears in the spring).
- In the last 2 years, two major depressive episodes have occurred that demonstrate the temporal seasonal relationships defined in the two criteria above, and no nonseasonal major depressive episodes have occurred during that same period.
- Seasonal major depressive episodes (as described above) substantially outnumber the nonseasonal major depressive episodes that may have occurred over the individual's lifetime.

Magnusson A, Partonen T. *CNS Spectr*. Vol 10, No 8. 2005.

seen in children who usually present with fatigue, irritability, sleep inertia, and school problems. These children tend to attribute the cause of their problems to the external world of family and school rather than having insight into their symptoms.¹⁴

The impairment of functioning associated with SAD is often worse than that related to most chronic medical conditions.¹⁵ Despite the depressive episodes seldom being severe enough to require absence from work, most patients with SAD do experience disability at work and in their social relations. Frequent symptoms, such as daytime tiredness and fatigue, are of concern not only for work performance but also for public safety, as they may adversely affect, for example, driving ability. Hence, the effort put into the detection and treatment of SAD seems justified in primary and occupational healthcare settings.

Depressive episodes typically begin during the autumn, usually in September to November, depending on the latitude of residence. Untreated, these episodes generally resolve by the following spring, in most cases by February to April, although some individuals do not fully recover before the early summer.¹⁶ Some patients have also reported short periods of depressed mood recurring during the summer if levels of ambient light exposure are reduced for any reason, such as poor weather conditions. In summer, some individuals may in addition experience a reversal of their symptoms, including affective periods with elation, increased libido, improved social activity, increased energy, decreased need for sleep, reduced appetite, and loss of weight, but manic episodes of bipolar disorder occur rarely (in 2% to 8%, according to Lingjaerde and colleagues¹⁷ and data derived from the National Institute of Mental Disorders Seasonal Studies Program). However, less severe hypomanic episodes are not infrequent in patients with SAD (in 34%).¹⁸ Hyperthymia is also relatively common; it may become clinically significant although it is not severe enough to meet the criteria for hypomania.

TABLE 3. DIAGNOSTIC CRITERIA FOR RESEARCH ON SEASONAL AFFECTIVE DISORDER⁷

- Three or more episodes of mood (affective) disorder must occur, with onset within the same 90-day period of the year, ≥ 3 consecutive years.
- Remissions also occur within a particular 90-day period of the year.
- Seasonal episodes substantially outnumber any non-seasonal episodes that may occur.

Magnusson A, Partonen T. *CNS Spectr.* Vol 10, No 8. 2005.

The prolonged duration of the depressive episodes distinguishes the episodes of SAD from the so-called holiday blues, a short-lived reaction to psychosocial stress that typically occurs around the holiday season. The recurrent depressive episodes are not primar-

TABLE 4. SYMPTOMS AND SIGNS IN PATIENTS WITH WINTER SAD*

<u>Frequent</u>	<u>Percent</u>
• Sadness	96
• Decreased activity	96
• Social misfortune [†]	92
• Anxiety	86
• Irritability [†]	86
• Occupational misfortune	84
• Daytime tiredness [†]	81
<u>Fairly frequent</u>	<u>Percent</u>
• Increased sleep	76
• Poor quality of sleep [†]	75
• Increased weight	74
• Carbohydrate craving	70
• Decreased libido	68
• Increased appetite	65
<u>Fairly infrequent</u>	<u>Percent</u>
• Suicidal thoughts [‡]	35
• Decreased sleep [†]	31
<u>Infrequent</u>	<u>Percent</u>
• Mixed or no change in appetite [‡]	17
• Mixed or no change in weight [†]	17
• Decreased appetite	15
• Decreased weight	7
• Mixed or no change in sleep [†]	5
• No change in activity [†]	2

* Data derived from the NIMH Seasonal Studies Program (N=662).

† N=366.

‡ From the Seasonal Mood Clinic at the University Hospital-UBC Site (N=46).⁴

SAD=seasonal affective disorder; NIMH=National Institute of Mental Health; UBC=University of British Columbia.

Lam RW, Buchanan A, Remick RA. Seasonal affective disorder—a Canadian sample. *Ann Clin Psychiatry.* 1989;1:241-245.

Magnusson A, Partonen T. *CNS Spectr.* Vol 10, No 8. 2005.

ily attributable to a regularly recurring psychosocial stress, such as winter unemployment, though such distress may certainly exacerbate symptoms.

Depressive episodes are usually mild to moderate in severity, but ~10% of patients require hospitalization and 2% are given electroconvulsive treatment due to severe depressive episodes.¹⁸ Patients with SAD rarely have psychotic symptoms or are at risk of suicide, judging from statistics, but this fact should not be given too much reassurance to clinicians. Patients suffering from a depressive episode, regardless of the primary diagnosis, need to be monitored carefully for emerging suicidal thoughts.

Course of Illness

The onset of SAD typically occurs between 20 and 30 years of age but affected individuals do not usually seek psychiatric help for some years.¹⁹ Many individuals may in fact be more distressed by the decreased activity and fatigue than by the mood changes and therefore often seek help of a physician rather than a psychiatrist at the onset. Many patients suffer from either more severe or longer episodes with time.²⁰ However, the course of illness is variable. Some patients retain their fundamentally seasonal pattern. Others develop a more complicated course characterized by non-seasonal as well as seasonal episodes. Still others appear to remit.

After a period of 5–11 years from the initial diagnosis, 22% to 42% of patients were still suffering from SAD, as assessed by structured clinical interviews and collateral records, while 33% to 44% had developed a non-seasonal pattern in subsequent episodes. The remaining patients (~6%) had subsyndromal SAD, or the disorder resolved completely in 14% to 18% of the patients.^{21,22} Since these data are derived from follow-up after treatment rather than from studying the natural course of the syndrome, it is unclear to what degree they reflect instability in the illness itself as opposed to the influence of treatment and awareness of the nature of the condition.

Diagnostic interview studies together with case record studies suggest that the emergence of non-seasonal depressive episodes is associated with greater severity of the illness and poorer response to bright light therapy. Bright light therapy, while remaining the treatment of choice for many, may be insufficient for more severely ill patients.²² A short duration of the index episode and a high frequency of episodes are associated with a continuing seasonal course of illness,²¹ and the presence of atypical depressive symptoms is the best predictor of season-bound recurrence.^{23, 24} Neither the age at onset of SAD or duration of the disease history could be identified as

predictors of the subsequent course of illness after follow-up for 2–8 years.^{25,26} According to these studies, there is a marked proportion of patients who recover completely with time and SAD cannot be regarded as a prodromal or premature form of a more chronic or more severe affective disorder.

After all, SAD is a condition that is strongly influenced by behavior (eg, how much time the individual chooses to spend outdoors or seek light exposure). Therefore, awareness of the condition and the individual's behavioral response to it would be expected to affect its course and a favorable outcome can be due to either true recovery or simply good symptom control.

Comorbid Conditions

In clinical practice, it is common that patients have concurrently more than just one mental disorder. Patients with SAD may also have other psychiatric conditions, each of which may require attention plus subsequent intervention. Mixed conditions tend to compromise the recognition and identification of SAD. It may well be that none of the key symptoms of SAD is the presenting complaint nor of principal concern in those patients with comorbid conditions. In such cases, the clinical picture needs to be assessed with taking a detailed history and monitoring the patient during short-interval visits before tailoring the treatment.

Many bulimia nervosa (BN) patients suffer from seasonal depressive symptoms.²⁷ Some data^{28,29} have indicated that patients with SAD and those with BN have similar attitudes towards eating, reflected as distorted perceptions of body size and shape, but opposite styles of eating (low versus high scores of restraint eating behaviors, respectively).

Whereas healthy subjects report sedation after ingestion of carbohydrates, depressed SAD patients experience activation and are less sensitive to the sweet taste.^{30,31} Resting metabolic rates may also be increased in depressed SAD patients secondary to changes in appetite and caloric intake.³²

The lifetime prevalence of anxiety disorders in patients with SAD is high, though not different from the rate seen in non-seasonal recurrent major depression. Generalized anxiety disorder, simple phobias, and social phobia are among the most prevalent comorbid disorders.³³

EPIDEMIOLOGY

The epidemiology of SAD is a very active research field, recent reviews^{34–36} have included close to 200 reports. Thus, an all-inclusive review is beyond the scope of this article.

Even before SAD was first systematically described,² several studies³⁷⁻⁴⁰ examined seasonal variation in the delivery of health care for affective conditions. The indices of mood disorders that had been examined for seasonal variations were, for example, the rate of suicide, use of electroconvulsive therapy, hospital admission for affective disorders, onset of depression, general practitioner consultation for depression, and number of antidepressant prescriptions. These studies have been reviewed by Wehr and Rosenthal,³⁷ Thompson,³⁸ Carney,³⁹ and Eastwood.⁴⁰

Approximately 18 years ago, Rosenthal and colleagues⁴¹ designed the SPAQ to screen for symptoms of SAD. A central feature of the SPAQ is the Seasonality Score scale. It investigates seasonal changes in six symptoms. The sum score of these six items (the seasonality score) can range from 0–24. If an individual has a seasonality score of >11, feels that the seasonal changes are a problem at least to a moderate degree, and feels worst in the winter, then the SPAQ classifies that person as having SAD. The SPAQ has been used in at least 30 epidemiological studies of SAD⁴²⁻⁷¹ in various countries, in different ethnic populations, and on four different continents.

Several studies on the psychometric properties of the SPAQ have been published, both on its reliability^{4,56,61,72-81} and validity^{4,27,42,44,45,50,58,60,72,75,76,81-86} in normal and in patient populations. The Seasonality Score scale is the most important, and best studied item of the SPAQ and has a good internal consistency.^{73,75,76} The test-retest correlation for the Seasonality Score scale, and other reliability measures of the SPAQ is generally fairly good. There are two main types of validation studies of the SPAQ. First, studies⁷⁷ that have first found significantly different mean depression ratings scores (or SPAQ-scores) between groups of SAD patients and normals. Then there are the studies⁷⁷ that have compared SPAQ-diagnoses with clinical diagnoses of SAD. Generally, the validation studies have not been as favorable for the SPAQ as the reliability studies. The specificity, in particular, has been a problem. The SPAQ did not indicate that the SPAQ prevalence estimates of SAD are too high.^{27,42,82} However, three more recent studies^{78,86,88} have concluded that the SPAQ is prone to scoring high prevalence rates of SAD. The strongest evidence for SPAQ overrating the prevalence of SAD comes from studies that have screened large samples of the general population for mood disorders and subsequently applied the diagnostic criteria for SAD to those who had a mood disorder.^{60,86,88} The prevalence rates found by these methods were lower than when estimated by the SPAQ. Mersch³⁶ recently published a thorough review on the reliability, external

validity, and contrast validity of the SPAQ. The more recently published Seasonal Health Questionnaire may have advantages as a screening tool.⁸⁹

Epidemiological studies³⁷ based on the SPAQ have found prevalence rates ranging from <1% to >10%. A consistent finding in SPAQ studies^{90,91} is that the prevalence of SAD is higher among women than men, and that SAD is more common in younger individuals. Furthermore, higher rates are found in North America than in Europe. As expected, prevalence rates are generally lower in warmer and sunnier countries compared with more northern locations (discussed in “Latitude”).⁹² The difference in prevalence rates found may also partly be explained by differences in methodology; selection bias in the sample; respondents; and different cut-off points selected on the SPAQ, etc.

Cross-Sectional Surveys

The SPAQ focuses directly upon seasonal variations in mood and behaviors and in this respect is a well suited instrument to investigate SAD. The disadvantages are, however, that it relies upon the participants' own subjective evaluation of their seasonal difficulties, and also upon their retrospective recall of the temporal pattern. The reliability of recall of affective episodes may be poor⁹³ and the recall of seasonal pattern of depressive episodes may also be poor.⁹⁴ To circumvent this problem several studies^{50,87,88,95-103} have measured current depressive symptoms successively across seasons. These studies differ in several respects. The surveys were carried out at varying latitudes, different instruments were used, etc. In spite of the heterogeneity, almost all the studies found seasonal variations, the psychopathology usually peaking in autumn or winter. The only study that did not detect any seasonal variations was that of Magnusson,⁹⁶ which is of interest since studies with the SPAQ⁴⁷ have previously found exceptionally low rates of SAD in Icelanders. Two studies in elderly populations^{104,105} have found that the seasonal variations in mood are relatively mild in this age group.

Seasonal Affective Disorder in Patient Populations

Populations of depressed out-patients have been screened for seasonal variations, both by use of the SPAQ and by examining patient charts.^{81,106-113} These studies have generally reported that 10% to 20% of this patient group suffers from SAD. These out-patients do more often have a bipolar diagnosis than SAD patients identified from the general population.

Epidemiology of Seasonal Affective Disorder in Children and Adolescents

At least six surveys have examined the epidemiology of SAD in children and adolescents. Carskadon and Acebo¹¹⁴ estimated that 4.2% of children 9–12 years of age in the United States met their criteria for SAD. SAD was less common in the young, and in girls. Swedo and colleagues¹¹⁵ estimated the prevalence of SAD in children and adolescents as 3.3%. The prevalence was not statistically different between the sexes, but increased with increasing age. Puberty was associated with a higher rate of SAD in girls, but not in boys. There are at least four studies on adolescents and college students.^{68,71,116,117} Relatively high rates of SAD are found, generally higher in females than in males.

SUMMER SEASONAL AFFECTIVE DISORDER

The definitions of SAD in the *DSM-III-R*, the *DSM-IV*, and the *ICD-10* are open as to in which season the mood episodes recur. Some individuals experience regular depressions in summer or spring.^{118,119} This condition appears to be less common than SAD.^{42,43,47} However, it may not be infrequent in tropical climates⁵⁴ or in patients with more severe mood disorders.¹⁰⁸

Seasonal Variations in Psychiatric Illnesses Other Than Mood Disorders

Most studies of seasonal variations in psychiatric disorders have focused on mood disorders. However, several other psychiatric illnesses also show seasonal exacerbation. There are at least 11 studies on seasonality in eating disorders.^{27,28,120-128} The symptoms of BN, in particular, tend to worsen during winter. Seasonal variations in anxiety disorders,¹²⁹ alcoholism,¹³⁰ and obsessive-compulsive disorder¹³¹ have also been described. SAD patients frequently have comorbid psychiatric disorders^{13,28,82,119,127,132-134} and the disorder is overrepresented in patients with eating disorders^{27,135} and alcoholism.¹⁴¹ SAD patients also frequently have comorbid Axis II diagnoses.^{137,138} Some studies,^{58,97} however, have found that seasonal exacerbation are relatively specific for mood symptoms, and do not occur in for instance anxiety symptoms.

Latitude

SAD is thought primarily to be caused by lack of light in winter, hence, a number of studies have examined whether rates of SAD and s-SAD vary with latitude. Already in 1986, preliminary evidence^{139,140} had found that SAD was more prevalent at higher

northern latitudes. Rosen and colleagues⁴³ were first to examine this issue directly by measuring the prevalence of SAD at four different locations in the US. In this survey, there was a latitude gradient in which the prevalence of winter problems (combined SAD+s-SAD) increased with increasing latitude. Similar results were obtained in a study comparing Alaska (65° N) to Nashua, New Hampshire (42.5° N).⁴⁵

At least four studies^{53,56,71,141} have examined the latitude hypothesis in Scandinavia (54°–70° N). The results have been mixed. A latitude effect was observed in a study from Japan (27°–44° N),¹¹⁰ but not in surveys in Italy,⁴⁹ Turkey,⁵⁹ or among Australia women.¹⁴²

Carskadon and Acebo¹¹⁴ found that symptoms of SAD in children were more frequent in the central and northern parts of the US than at more southern locations (south of 36° N).

Brewerton and colleagues¹³⁵ examined patients with eating disorders and found evidence for a higher prevalence of winter problems in this patient group at higher latitudes than at more southern locations.

Two recent studies from the US⁸⁹ and Canada¹⁴³ did not rely upon the SPAQ but instead applied the *DSM-IV* diagnostic criteria for SAD to large random populations. These studies did not detect any effect of latitude on the prevalence of SAD.

Another approach is to compare the results of different prevalence studies in relation with the latitude at which they were performed. Mersch and colleagues¹⁴⁴ computed correlations between prevalence rates and latitudes at which the populations resided. The overall correlation for all studies at different continents was low. However, when studies from the US and Europe were analysed separately, a somewhat clearer correlation emerged, which reached statistical significance for the US. The authors however concluded that: "If latitude influences prevalence, this influence is only weak".

Latitude is only an indirect measure of the amount of light individuals receive in winter. Obviously, climatic factors such as coast climate versus inland climate will also determine the amount of daylight during winter. Studies comparing sunny versus overcast regions and outdoor versus indoor employment⁴⁷ have been undertaken. Furthermore, SAD has been correlated with hours of sunshine in winter, temperature, daylength, and global and solar irradiation.^{87,110,145-148}

An establishment of a clear latitude gradient would have supported the validity of the concept of SAD. Several factors may obscure the elucidation of the latitude gradient. In addition to methodological problems, populations residing at northern loca-

tions may have adapted to the long arctic winter. Furthermore, there is a very marked mobility among populations residing at northern locations³⁵ and if individuals who are more susceptible to experience SAD are more likely to migrate southward, the latitude gradient will be even more elusive.

The Prevalence of Seasonal Affective Disorder in Different Ethnic Groups

Twin studies^{149,150} have revealed that genes may influence the tendency to experience seasonal changes in mood and behavior. Therefore, it is theoretically possible that the prevalence of SAD may differ among ethnic groups. The issue of ethnicity and SAD has been addressed in at least 13 studies.

The aborigines of northern Scandinavia (called Lapps, Samer, or Kvener) have been studied by four groups. Näyhä and colleagues¹⁰¹ administered the Cornell Medical Index questionnaire to 1,251 reindeer herders in northern Finland throughout 1 year. Ten percent of the participants were Lapps. Seasonal variations in depressive symptoms did not seem to differ between Lapps and Finns. Saarijärvi and colleagues¹⁵¹ administered the SPAQ to 598 Finns and 126 Lapps in northern Finland (68°–70° N). The odds ratio for SAD was 2.2 for Finns against Lapps. Konradsen⁵³ surveyed an area in northern Norway with the SPAQ. The mean seasonality score did not differ between the aborigines and other Norwegians in the same location. Hansen and colleagues¹⁵² surveyed a group of 3,736 individuals living in a small community in northern Norway (70° N). There was no statistically significant difference in the risk for winter depression between the aborigines (Samer) and the other Norwegians.

Suhail and Cochrane⁸⁷ administered the Hospital Anxiety and Depression scale (HAD) monthly for 1 year to 25 white British women and 25 women of Asian origin born in Britain. The latter group proved to have more marked seasonal variation in mood. However, the authors were of the opinion that this difference was not caused by genetic factors. The same authors examined hospital admission rates for depression in Birmingham, United Kingdom (UK). There was a three-fold higher number of admissions in winter than in summer in a group of patients of Asian origin, but only a 26% winter increase among whites.¹⁵³

Iceland is an isolated island in the North Atlantic Ocean. The Icelandic population has lived in virtual isolation since it was first settled ~1,000 years ago. In SPAQ surveys in Iceland and the US, SAD and s-SAD were found to be less common in Iceland than on the east coast of North America.⁴⁷ The authors speculated that Icelandic ancestors with a genetic

predisposition toward SAD might have been at a disadvantage to survive and ensure the survival of their offspring. To test this hypothesis of a population selection toward increased tolerance of winter darkness, SAD was studied in a population of immigrants of wholly Icelandic descent in Canada.⁴⁸ The prevalence of SAD and s-SAD was several times lower among the immigrants than on the east coast of the US. These findings have recently been replicated in a study comparing Canadians of Icelandic descent living in Winnipeg with other citizens of Winnipeg in Canada.¹⁵⁴ These studies in Icelanders have been based on the SPAQ with the limitations that it imposes. However, seasonal variation in mood has also been examined by cross-sectional methods in Iceland.⁹⁶ The HAD scale was administered in winter, spring, summer, and autumn. No seasonal variation in mood was detected. That is in contrast with cross-sectional surveys from several other countries.

In addition to these three ethnic groups, Russians have been compared with both Norwegians and the aborigines of Siberia. Nilssen and colleagues¹⁵⁵ examined the two populations in Svalbard, Norway, (78° N), the northernmost regularly inhabited settlement in the world. The 1-year prevalence of depression was 2–3 times higher among Russians compared with Norwegians. In addition, 80% of the Russians reported experiencing their depression in the dark period of the year but only 40% to 50% of the Norwegians. Similarly, in a SPAQ study in the former Soviet Union,⁴⁴ aborigines of Siberia had lower prevalence rates of SAD than Russians in the same area. Such a difference was however not found when rates of SAD were compared between natives of Alaska and other US citizens in Alaska. The prevalence of SAD is low in Japan.^{51,68,156}

Acclimatization

Do people acclimate to the long dark winter at high northern locations? Suhail and Cochrane⁸⁷ compared Asian women who had recently moved to the UK with women of Asian origin who were born in the UK. The HAD was administered monthly for 1 year. The two Asian groups had similar mean HAD scores in summer (4.6) but the Asian born group had a mean HAD score of 8.4 in winter while the Asian women born in the UK had a mean score of 6.2. That suggests that the women who had spent for their whole life in Britain were in some ways better adapted to the long winter.

Saarijärvi and colleagues¹⁵¹ in Finland found some evidence for the hypothesis that the longer a given individual had resided in the area, the fewer seasonal symptoms they reported.

Studies from northeast Scotland,¹⁵⁷ Alaska,⁴⁵ north Canada,¹⁰⁹ and New England¹¹⁶ have found similar results of increased susceptibility for SAD in individuals who have lived for a shorter time at high northern locations. On the other hand, three other studies have failed to find this effect, or even found contrary results.^{141,152} For instance, Murase and colleagues¹⁰² examined Japanese residing in Stockholm, Sweden (~59° N). They compared two groups of Japanese (those who had lived in Stockholm for <2 years and those who had lived there for >10 years). The Beck Depression Inventory was administered to the two groups during summer and winter. There was no indication that the Japanese who had stayed longer in Stockholm had acclimatized to the long Scandinavian winter. In fact, that group had significantly more seasonal variation in mood than those who had only stayed for 2 years. It seems that the propensity to experience SAD differs between ethnic groups, and individuals who migrate to higher latitudes appear to be more prone to develop SAD.

CONCLUSION

SAD is one of that few psychiatric conditions with a predictable time of onset and remission, it has a characteristic set of symptoms, and responds to a specific treatment, namely bright light. SAD may thus be one of the best delineated syndromes in psychiatry. SAD is a relatively common condition, although exact prevalence rates still remain elusive. Epidemiological studies find that SAD is more common in women and in younger adults. **CNS**

REFERENCES

- Rosenthal NE, Genhart MJ, Sack DA, Skwerer RG, Wehr TA. Seasonal affective disorder: relevance for treatment and research of bulimia. In: Hudson JJ, Pope HG. *The Psychology of Bulimia*. Washington, DC: American Psychiatric Association; 1987:205-228.
- Rosenthal NE, Sack DA, Gillin JC, et al. Seasonal affective disorder. A description of the syndrome and preliminary findings with light therapy. *Arch Gen Psychiatry*. 1984;41:72-80.
- Partonen T, Magnusson A. *Seasonal Affective Disorder: Practice and Research*. Oxford, UK: Oxford University Press; 2001.
- Kasper S, Rogers SL, Yancey A, Schulz PM, Skwerer RG, Rosenthal NE. Phototherapy in individuals with and without subsyndromal seasonal affective disorder. *Arch Gen Psychiatry*. 1989;46:837-844.
- Diagnostic and Statistical Manual of Mental Disorders*. 3rd ed. rev. Washington, DC: American Psychiatric Association; 1987.
- Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, DC: American Psychiatric Association; 1994.
- International Classification of Diseases*. 10th ed. Geneva, Switzerland; 1994.
- Winkler D, Willeit M, Prashak-Rieder N, et al. Changes of clinical pattern in seasonal affective disorder (SAD) over time in a German-speaking sample. *Eur Arch Psychiatry Clin Neurosci*. 2002;252:54-62.
- Lam RW, Buchanan A, Remick RA. Seasonal affective disorder—a Canadian sample. *Ann Clin Psychiatry*. 1989;1:241-245.
- Tam EM, Lam RW, Robertson HA, Stewart JN, Yatham LN, Zis AP. Atypical depressive symptoms in seasonal and non-seasonal mood disorders. *J Affect Disord*. 1997;44:39-44.
- Young MA, Watel LG, Lahmeyer HW, Eastman CI. The temporal onset of individual symptoms in winter depression: differentiating underlying mechanisms. *J Affect Disord*. 1991;22:191-197.
- Allen JM, Lam RW, Remick RA, Sadovnick AD. Depressive symptoms and family history in seasonal and nonseasonal mood disorders. *Am J Psychiatry*. 1993;150:443-448.
- Stamenkovic M, Aschauer HN, Riederer F, et al. Study of family history in seasonal affective disorder. *Neuropsychobiology*. 2001;44:65-69.
- Swedo SE, Allen AJ, Glod CA, et al. A controlled trial of light therapy for the treatment of pediatric seasonal affective disorder. *J Am Acad Child Adolesc Psychiatry*. 1997;36:816-821.
- Schlager D, Froom J, Jaffe A. Winter depression and functional impairment among ambulatory primary care patients. *Compr Psychiatry*. 1995;36:18-24.
- Lingjaerde O, Regine Foreland A. Characteristics of patients with otherwise typical winter depression, but with incomplete summer remission. *J Affect Disord*. 1999;53:91-94.
- Lingjaerde O, Reichborn-Kjennerud T. Characteristics of winter depression in the Oslo area (60 degrees N). *Acta Psychiatr Scand*. 1993;88:111-120.
- Partonen T, Rosenthal NE. Symptoms and course of illness. In: Partonen T, Magnusson A, eds. *Seasonal Affective Disorder, Practice and Research*. Oxford, England: Oxford University Press; 2001:11-18.
- Thompson C, Isaacs G. Seasonal affective disorder—a British sample. Symptomatology in relation to mode of referral and diagnostic subtype. *J Affect Disord*. 1988;14:1-11.
- Wirz-Justice A, Bucheli C, Graw P, Kielholz P, Fisch HU, Woggon B. Light treatment of seasonal affective disorder in Switzerland. *Acta Psychiatr Scand*. 1986;74:193-204.
- Thompson C, Raheja SK, King EA. A follow-up study of seasonal affective disorder. *Br J Psychiatry*. 1995;167:380-384.
- Schwartz PJ, Brown C, Wehr TA, Rosenthal NE. Winter seasonal affective disorder: a follow-up study of the first 59 patients of the National Institute of Mental Health seasonal studies program. *Am J Psychiatry*. 1996;153:1028-1036.
- Sakamoto K, Nakadaira S, Kamo K, Tomitaka S, Kamo T. Long-term course of seasonal affective disorders: a preliminary report. *Jpn J Psychiatry Neurol*. 1993;47:470-472.
- Sakamoto K, Nakadaira S, Kamo K, Kamo T, Takahashi K. A longitudinal follow-up study of seasonal affective disorder. *Am J Psychiatry*. 1995;152:862-868.
- Leonhardt G, Wirz-Justice A, Krauchi K, Graw P, Wunder D, Haug HJ. Long-term follow-up of depression in seasonal affective disorder. *Compr Psychiatry*. 1994;35:457-464.
- Graw P, Gisin B, Wirz-Justice A. Follow-up study of seasonal affective disorder in Switzerland. *Psychopathology*. 1997;30:208-214.
- Lam RW, Solyom L, Tompkins A. Seasonal mood symptoms in bulimia nervosa and seasonal affective disorder. *Compr Psychiatry*. 1991;32:552-558.
- Berman K, Lam RW, Goldner EM. Eating attitudes in seasonal affective disorder and bulimia nervosa. *J Affect Disord*. 1993;29:219-225.
- Kräuchi K, Reich S, Wirz-Justice A. Eating style in seasonal affective disorder: Who will gain weight in winter? *Compr Psychiatry*. 1997;38:80-87.
- Rosenthal NE, Genhart MJ, Caballero B, et al. Psychobiological effects of carbohydrate- and protein-rich meals in patients with seasonal affective disorder and normal controls. *Biol Psychiatry*. 1989;25:1029-1040.
- Arbisi PA, Levine AS, Nerenberg J, Wolf J. Seasonal alteration in taste detection and recognition threshold in seasonal affective disorder: the proximate source of carbohydrate craving. *Psychiatry Res*. 1996;59:171-182.
- Gaist PA, Obarzanek E, Skwerer RG, Duncan CC, Shultz PM, Rosenthal NE. Effects of bright light on resting metabolic rate in patients with seasonal affective disorder and control subjects. *Biol Psychiatry*. 1990;28:989-996.
- Levitt AJ, Joffe RT, Brecher D, MacDonald C. Anxiety disorders and anxiety symptoms in a clinic sample of seasonal and non-seasonal depressives. *J Affect Disord*. 1993;28:51-56.
- Magnusson A. An overview of epidemiological studies on seasonal affective disorder. *Acta Psychiatr Scand*. 2000;101:176-184.
- Magnusson A. Acclimatization. In: Partonen T, Magnusson A, eds. *Seasonal Affective Disorder, Practice and Research*. Oxford, UK: Oxford University Press; 2001:47-54.
- Mersch PP. Prevalence from population surveys. In: Partonen T, Magnusson A, eds. *Seasonal Affective Disorder, Practice and Research*. Oxford, UK: Oxford University Press; 2001:121-140.
- Wehr TA, Rosenthal NE. Seasonality and affective illness. *Am J Psychiatry*. 1989;146:829-839.
- Thompson C. Seasonality in depression. In: Thompson C, Silverstone T, eds. *Seasonal Affective Disorder*. London, England: CNS Publishers; 1989:1-19.
- Carney P, Fitzgerald C, Monaghan C. Seasonal variations in mania. In: Thompson C, Silverstone T, eds. *Seasonal Affective Disorder*. London: CNS publishers; 1989:19-29.
- Eastwood MR, Peter AM. Epidemiology and seasonal affective disorder. *Psychol Med*. 1988;18:799-806.
- Rosenthal NE, Genhart M, Jacobsen FM, Skwerer RG, Wehr TA. Disturbances of appetite and weight regulation in seasonal affective disorder. *Ann N Y Acad Sci*. 1987;499:216-230.

42. Kasper S, Wehr TA, Bartko JJ, Gaist PA, Rosenthal NE. Epidemiological findings of seasonal changes in mood and behavior. A telephone survey of Montgomery County, Maryland. *Arch Gen Psychiatry*. 1989;46:823-833.
43. Rosen LN, Targum SD, Terman M, et al. Prevalence of seasonal affective disorder at four latitudes. *Psychiatry Res*. 1990;31:131-144.
44. Booker JM, Hellekson CJ, Putilov AA, Danilenko KV. Seasonal depression and sleep disturbances in Alaska and Siberia: a pilot study. *Arctic Med Res*. 1991;(suppl):281-284.
45. Booker JM, Hellekson CJ. Seasonal depression and sleep disturbances in Alaska and Siberia: a pilot study. *Am J Psychiatry*. 1992;149:1176-1182.
46. Ito A, Ichihara M, Hisanaga N, et al. Prevalence of seasonal mood changes in low latitude area: Seasonal Pattern Assessment Questionnaire score of Quezon City workers. *Jpn J Psychiatry Neurol*. 1992;46:249.
47. Magnusson A, Stefansson JG. Prevalence of seasonal affective disorder in Iceland. *Arch Gen Psychiatry*. 1993;50:941-946.
48. Magnusson A, Axelsson J. The prevalence of seasonal affective disorder is low among descendants of Icelandic emigrants in Canada. *Arch Gen Psychiatry*. 1993;50:947-951.
49. Muscettola G, Barbato G, Ficca G, et al. Seasonality of mood in Italy: role of latitude and sociocultural factors. *J Affect Disord*. 1995;33:135-139.
50. Mersch PP, Middendorp HM, Bouhuys AL, Beersma DG, van den Hoofdakker RH. The prevalence of seasonal affective disorder in the Netherlands: a prospective and retrospective study of seasonal mood variation in the general population. *Biol Psychiatry*. 1999;45:1013-1022.
51. Ozaki N, Ono Y, Ito A, Rosenthal NE. Prevalence of seasonal difficulties in mood and behavior among Japanese civil servants. *Am J Psychiatry*. 1995;152:1225-1227.
52. Levine ME. Seasonal symptoms in the sub-Arctic. *Mil Med*. 1995;160:110-114.
53. Konradsen H. *Seasonal Affective Disorder: An Empirical Study of the Prevalence Among 6300 Young Adults Residing Between 58-70° N [dissertation]* [Norwegian]. Tromsø, Norway: University of Tromsø; 1995.
54. Morrissey SA, Raggatt PT, James B, Rogers J. Seasonal affective disorder: some epidemiological findings from a tropical climate. *Aust N Z J Psychiatry*. 1996;30:579-586.
55. Hegde AL, Woodson H. Prevalence of seasonal changes in mood and behavior during the winter months in central Texas. *Psychiatry Res*. 1996;62:265-271.
56. Broman JE, Hetta J. Prevalence of seasonal affective disorders and related symptoms at two latitudes in Sweden. Society for Light Treatment and Biological Rhythms Conference Proceedings; 1998. Abstract 228.
57. Dam H, Jakobsen K, Møllerup E. Prevalence of winter depression in Denmark. *Acta Psychiatr Scand*. 1998;97:1-4.
58. Wirz-Justice A, Graw P, Kräuchi K, Wacker HR. Seasonality in affective disorders in Switzerland. *Acta Psychiatr Scand Suppl*. 2003;(418):92-95.
59. Elbi H, Noyan A, Korukoglu S, et al. Seasonal affective disorder in eight groups in Turkey: A cross-national perspective. *J Affect Disord*. 2002;70:77-84.
60. Michalak EE, Wilkinson C, Dowrick C, Wilkinson G. Seasonal affective disorder: prevalence, detection and current treatment in North Wales. *Br J Psychiatry*. 2001;179:31-34.
61. Rohan KJ, Sigmon ST. Seasonal mood patterns in a northeastern college sample. *J Affect Disord*. 2000;59:85-96.
62. Han L, Wang K, Cheng Y, Du Z, Rosenthal NE, Primeau F. Summer and winter patterns of seasonality in Chinese college students: a replication. *Compr Psychiatry*. 2000;41:57-62.
63. Han L, Wang K, Du Z, Cheng Y, Simons JS, Rosenthal NE. Seasonal variations in mood and behavior among Chinese medical students. *Am J Psychiatry*. 2000;157:133-135.
64. Srisurapanont M, Intaprasert S. Seasonal variations in mood and behaviour: epidemiological findings in the north tropics. *J Affect Disord*. 1999;54:97-99.
65. McConville C, McQuaid M, McCartney A, Gilmore W. Mood and behaviour problems associated with seasonal changes in Britain and Ireland. *Int J Soc Psychiatry*. 2002;48:103-114.
66. Parslow RA, Jorm AF, Butterworth P, Jacomb PA, Rodgers B. An examination of seasonality experienced by Australians living in a continental temperate climate zone. *J Affect Disord*. 2004;80:181-190.
67. Agumadu CO, Yousufi SM, Malik IS, et al. Seasonal variation in mood in African American college students in the Washington, D.C., metropolitan area. *Am J Psychiatry*. 2004;161:1084-1089.
68. Imai M, Kayukawa Y, Ohta T, Li L, Nakagawa T. Cross-regional survey of seasonal affective disorders in adults and high-school students in Japan. *J Affect Disord*. 2003;77:127-133.
69. Rosen L, Knudson KH, Fancher P. Prevalence of seasonal affective disorder among U.S. Army soldiers in Alaska. *Mil Med*. 2002;167:581-584.
70. Haggarty JM, Cernovsky Z, Husni M, Minor K, Kermeen P, Merskey H. Seasonal affective disorder in an Arctic community. *Acta Psychiatr Scand*. 2002;105:378-384.
71. Sourander A, Koskelainen M, Helenius H. Mood, latitude, and seasonality among adolescents. *J Am Acad Child Adolesc Psychiatry*. 1999;38:1271-1276.
72. Hardin TA, Wehr TA, Brewerton T, et al. Evaluation of seasonality in six clinical populations and two normal populations. *J Psychiatry Res*. 1991;25:75-87.
73. Magnusson A, Friis S, Opjordsmoen S. Internal consistency of the Seasonal Pattern Assessment Questionnaire (SPAQ). *J Affect Disord*. 1997;42:113-116.
74. Young MA, Blodgett C, Reardon A. Measuring seasonality: psychometric properties of the Seasonal Pattern Assessment Questionnaire and the inventory for seasonal variation. *Psychiatry Res*. 2003;117:75-83.
75. Mersch PP, Vastenburger NC, Meesters Y, et al. Measuring seasonality: psychometric properties of the Seasonal Pattern Assessment Questionnaire and the Inventory for Seasonal Variation. *J Affect Disord*. 2004;80:209-219.
76. Goikolea JM, Miralles G, Bulbena Cabre A, Vieta E, Bulbena A. Spanish adaptation of the seasonal pattern assessment questionnaire (SPAQ) in the adult and children-adolescent versions. [Spanish]. *Actas Esp Psiquiatr*. 2003;31:192-198.
77. Lund E, Hansen V. Responses to the Seasonal Pattern Assessment Questionnaire in different seasons. *Am J Psychiatry*. 2001;158:316-318.
78. Raheja SK, King EA, Thompson C. The Seasonal Pattern Assessment Questionnaire for identifying seasonal affective disorders. *J Affect Disord*. 1996;41:193-199.
79. Rosenthal NE, Genhart MJ, Sack DA, Skwerer RG, Wehr TA. Seasonal affective disorder: relevance for treatment and research of bulimia. In: Hudson JL, Pope HG, eds. *The Psychobiology of Bulimia*. Washington, DC: American Psychiatric Press; 1987:205-228.
80. Marriott PF. An assessment of SPAQ and SPAQ+ reliability. *Bulletin of the Society for Light Treatment and Biological Rhythms*. 1993;5:32.
81. Christensen EM, Larsen JK, Gjerris A. The stability of the Seasonal Pattern Assessment Questionnaire score index over time and the validity compared to classification according to DSM-III-R. *J Affect Disord*. 2003;74:167-172.
82. Magnusson A. Validation of the Seasonal Pattern Assessment Questionnaire (SPAQ). *J Affect Disord*. 1996;40:121-129.
83. Eagles JM, Naji SA, Gray DA, Christie J, Beattie JA. Seasonal affective disorder among primary care consultants in January: prevalence and month by month consultation patterns. *J Affect Disord*. 1998;49:1-8.
84. Murray G. The Seasonal Pattern Assessment Questionnaire as a measure of mood seasonality: a prospective validation study. *Psychiatry Res*. 2003;120:53-59.
85. Thompson C, Thompson S, Smith R. Prevalence of seasonal affective disorder in primary care; a comparison of the seasonal health questionnaire and the seasonal pattern assessment questionnaire. *J Affect Disord*. 2004;78:219-226.
86. Thompson C, Stinson D, Fernandez M, Fine J, Isaacs G. A comparison of normal, bipolar and seasonal affective disorder subjects using the Seasonal Pattern Assessment Questionnaire. *J Affect Disord*. 1988;14:257-264.
87. Suhail K, Cochrane R. Seasonal changes in affective state in samples of Asian and white women. *Soc Psychiatry Psychiatr Epidemiol*. 1997;32:149-157.
88. Nayyar K, Cochrane R. Seasonal changes in affective state measured prospectively and retrospectively. *Br J Psychiatry*. 1996;168:627-632.
89. Blazer DG, Kessler RC, Swartz MS. Epidemiology of recurrent major and minor depression with a seasonal pattern. The National Comorbidity Survey. *Br J Psychiatry*. 1998;172:164-167.
90. Levitt AJ, Boyle MH. The impact of latitude on the prevalence of seasonal depression. *Can J Psychiatry*. 2002;47:361-367.
91. Eagles JM, Wileman SM, Cameron IM, et al. Seasonal affective disorder among primary care attenders and a community sample in Aberdeen. *Br J Psychiatry*. 1999;175:472-475.
92. Thompson C, Cowan A. The Seasonal Health Questionnaire: a preliminary validation of a new instrument to screen for seasonal affective disorder. *J Affect Disord*. 2001;64:89-98.
93. Bromet EJ, Dunn LO, Connell MM, Dew MA, Schulberg HC. Long-term reliability of diagnosing lifetime major depression in a community sample. *Arch Gen Psychiatry*. 1986;43:435-440.
94. Wicki W, Angst J, Merikangas KR. The Zurich Study. XIV. Epidemiology of seasonal depression. *Eur Arch Psychiatry Clin Neurosci*. 1992;241:301-306.
95. Lacoste V, Wirz-Justice A. Seasonality in personality dimensions. *Psychiatry Res*. 1987;21:181-183.
96. Magnusson A, Axelsson J, Karlsson MM, Oskarsson H. Lack of seasonal mood change in the Icelandic population: results of a cross-sectional study. *Am J Psychiatry*. 2000;157:234-238.
97. Terman M, Botticelli SR, Link BG. Seasonal symptom patterns in New York: patients and population. In: Thompson C, Silverstone T, eds. *Seasonal Affective Disorder*. London: CNS Publishers; 1989:77-95.
98. Haggag A, Eklund B, Linaker O, Gotestam KG. Seasonal mood variation: an epidemiological study in northern Norway. *Acta Psychiatr Scand*. 1990;81:141-145.

99. Schlager D, Schwartz JE, Bromet EJ. Seasonal variations of current symptoms in a healthy population. *Br J Psychiatry*. 1993;163:322-326.
100. Harris S, Dawson-Hughes B. Seasonal mood changes in 250 normal women. *Psychiatry Res*. 1993;49:77-87.
101. Nayha S, Vaisanen E, Hassi J. Season and mental illness in an Arctic area of northern Finland. *Acta Psychiatr Scand Suppl*. 1994;377:46-49.
102. Murase S, Murase S, Kitabatake M, Yamauchi T, Mathe AA. Seasonal mood variation among Japanese residents of Stockholm. *Acta Psychiatr Scand*. 1995;92:51-55.
103. Palinkas LA, Cravalho M, Browner D. Seasonal variation of depressive symptoms in Antarctica. *Acta Psychiatr Scand*. 1995;91:423-429.
104. Eagles JM, McLeod IH, Douglas AS. Seasonal changes in psychological well-being in an elderly population. *Br J Psychiatry*. 1997;171:53-55.
105. Genhart MJ, Kelly KA, Coursey RD, Datiles M, Rosenthal NE. Effects of bright light on mood in normal elderly women. *Psychiatry Res*. 1993;47:87-97.
106. Garvey MJ, Wesner R, Godes M. Comparison of seasonal and nonseasonal affective disorders. *Am J Psychiatry*. 1988;145:100-102.
107. Kasper S, Kamo T. Seasonality in major depressed inpatients. *J Affect Disord*. 1990;19:243-248.
108. Faedda GL, Tondo L, Teicher MH, Baldessarini RJ, Gelbard HA, Floris GF. Seasonal mood disorders. patterns of seasonal recurrence in mania and depression. *Arch Gen Psychiatry*. 1993;50:17-23.
109. Williams RJ, Schmidt GG. Frequency of seasonal affective disorder among individuals seeking treatment at a northern Canadian mental health center. *Psychiatry Res*. 1993;46:41-45.
110. Sakamoto K, Kamo T, Nakadaira S, Tamura A, Takahashi K. A nationwide survey of seasonal affective disorder at 53 outpatient university clinics in Japan. *Acta Psychiatr Scand*. 1993;87:258-265.
111. Hakkarainen R, Johansson C, Kiesepa T, et al. Seasonal changes, sleep length and circadian preference among twins with bipolar disorder. *BMC Psychiatry*. 2003;3:6.
112. Levitan RD, Jain UR, Katzman MA. Seasonal affective symptoms in adults with residual attention-deficit hyperactivity disorder. *Compr Psychiatry*. 1999;40:261-267.
113. Levitan RD, Masellis M, Basile VS, et al. Polymorphism of the serotonin-2A receptor gene (HTR2A) associated with childhood attention deficit hyperactivity disorder (ADHD) in adult women with seasonal affective disorder. *J Affect Disord*. 2002;71:229-233.
114. Carskadon MA, Acebo C. Parental reports of seasonal mood and behavior changes in children. *J Am Acad Child Adolesc Psychiatry*. 1993;32:264-269.
115. Swedo SE, Pleeter JD, Richter DM, et al. Rates of seasonal affective disorder in children and adolescents. *Am J Psychiatry*. 1995;152:1016-1019.
116. Low KG, Feissner JM. Seasonal affective disorder in college students: prevalence and latitude. *J Am Coll Health*. 1998;47:135-137.
117. Magnusson A. Light therapy to treat winter depression in adolescents in Iceland. *J Psychiatry Neurosci*. 1998;23:118-122.
118. Wehr TA, Sack DA, Rosenthal NE. Seasonal affective disorder with summer depression and winter hypomania. *Am J Psychiatry*. 1987;144:1602-1603.
119. Wehr TA, Giesen HA, Schulz PM, et al. Contrasts between symptoms of summer depression and winter depression. *J Affect Disord*. 1991;23:173-183.
120. Brewerton TD, Heffernan MM, Rosenthal NE. Psychiatric aspects of the relationship between eating and mood. *Nutr Rev*. 1986;44:78-88.
121. Kräuchi K, Wirz-Justice A. The four seasons: food intake frequency in seasonal affective disorder in the course of a year. *Psychiatry Res*. 1988;25:323-338.
122. Fornari VM, Braun DL, Sunday SR, et al. Seasonal patterns in eating disorder subgroups. *Compr Psychiatry*. 1994;35:450-456.
123. Blouin A, Blouin J, Aubin P, et al. Seasonal patterns of bulimia nervosa. *Am J Psychiatry*. 1992;149:73-81.
124. Fornari V, Sandberg D, Lachenmeyer J, Cohen D, Matthews M, Montero G. Seasonal variation in bulimia nervosa. *Ann NY Acad Sci*. 1989;575:509-511.
125. Levitan RD, Kaplan AS, Levitt AJ, Joffe RT. Seasonal fluctuations in mood and eating behavior in bulimia nervosa. *Int J Eat Disord*. 1994;16:295-299.
126. Lam RW, Goldner EM, Solyom L, Remick RA. A controlled study of light therapy for bulimia nervosa. *Am J Psychiatry*. 1994;151:744-750.
127. Gruber NP, Dilsaver SC. Bulimia and anorexia nervosa in winter depression: lifetime rates in a clinical sample. *J Psychiatry Neurosci*. 1996;21:9-12.
128. Yamatsuji M, Yamashita T, Arii I, Taga C, Tataru N, Fukui K. Seasonal variations in eating disorder subtypes in Japan. *Int J Eat Disord*. 2003;33:71-77.
129. Marriott PF, Greenwood KM, Armstrong SM. Seasonality in panic disorder. *J Affect Disord*. 1994;31:75-80.
130. Paschane D. Variability of substance abuse. Global variability of substance abuse: is latitude a unique etiological factor? *Int J Circumpolar Health*. 1998;57:228-238.
131. Yoney TH, Pigott TA, L'Heureux F, Rosenthal NE. Seasonal variation in obsessive-compulsive disorder: preliminary experience with light treatment. *Am J Psychiatry*. 1991;148:1727-1729.
132. Dilsaver SC, Qamar AB, Del Medico VJ. Secondary social phobia in patients with major depression. *Psychiatry Res*. 1992;44:33-40.
133. Halle MT, Dilsaver SC. Comorbid panic disorder in patients with winter depression. *Am J Psychiatry*. 1993;150:1108-1110.
134. Partonen T, Lonnqvist J. The influence of comorbid disorders and of continuation light treatment on remission and recurrence in winter depression. *Psychopathology*. 1995;28:256-262.
135. Brewerton TD, Krahn DD, Hardin TA, Wehr TA, Rosenthal NE. Findings from the Seasonal Pattern Assessment Questionnaire in patients with eating disorders and control subjects: effects of diagnosis and location. *Psychiatry Res*. 1994;52:71-84.
136. Anderson J, Mooney J, Peteet J, Meyer S. SPAQ and seasonality in alcohol- or drug-addicted patients: The women are SAD and the men are subsyndromal. Is it a problem? 1995; Society for Light Treatment and Biological Rhythms Conference Proceedings; 1998. Abstract.
137. Reichborn-Kjennerud T, Lingjaerde O, Dahl AA. Personality disorders in patients with winter depression. *Acta Psychiatr Scand*. 1994;90:413-419.
138. Reichborn-Kjennerud T, Lingjaerde O, Dahl AA. DSM-III-R personality disorders in seasonal affective disorder: change associated with depression. *Compr Psychiatry*. 1997;38:43-48.
139. Potkin SG, Zetin M, Stamenkovic V, Kripke D, Bunney WE Jr. Seasonal affective disorder: prevalence varies with latitude and climate. *Clin Neuropharmacol*. 1986;9(suppl 4):181-183.
140. Lingjaerde O, Bratlid T, Hansen T, Gøttestam K. Seasonal affective disorder and mid-winter insomnia in the far north: studies of two related chronobiological disorders in Norway. *Clin Neuropharmacol* 1986;9(suppl 4):189.
141. Partonen T, Partinen M, Lonnqvist J. Frequencies of seasonal major depressive symptoms at high latitudes. *Eur Arch Psychiatry Clin Neurosci*. 1993;243:189-192.
142. Murray GW, Hay DA. Seasonal affective disorder in Australia: is photoperiod critical? *Aust N Z J Psychiatry*. 1997;31:279-284.
143. Levitt AJ, Boyle MH, Joffe RT, Bauml Z. Estimated prevalence of the seasonal subtype of major depression in a Canadian community sample. *Can J Psychiatry*. 2000;45:650-654.
144. Mersch PP, Middendorp HM, Bouhuys AL, Beersma DG, van den Hoofdakker RH. Seasonal affective disorder and latitude: a review of the literature. *J Affect Disord*. 1999;53:35-48.
145. Okawa M, Shirakawa S, Uchiyama M, et al. Seasonal variation of mood and behaviour in a healthy middle-aged population in Japan. *Acta Psychiatr Scand*. 1996;94:211-216.
146. Molin J, Møllerup E, Bolwig T, Scheike T, Dam H. The influence of climate on development of winter depression. *J Affect Disord*. 1996;37:151-155.
147. Christensen EM, Gjerris A, Gjerris C, Larsen JK. Bipolar affective disorder. A retrospective study of 158 patients in a well-defined geographical region [Danish]. *Ugeskr Laeger*. 1998;160:5353-5357.
148. Young MA, Meaden PM, Fogg LF, Cheri EA, Eastman CI. Which environmental variables are related to the onset of seasonal affective disorder? *J Abnorm Psychol*. 1997;106:554-562.
149. Madden PA, Heath AC, Rosenthal NE, Martin NG. Seasonal changes in mood and behavior. The role of genetic factors. *Arch Gen Psychiatry*. 1996;53:47-55.
150. Jang KL, Lam RW, Livesley WJ, Vernon PA. Gender differences in the heritability of seasonal mood change. *Psychiatry Res*. 1997;70:145-154.
151. Saarijarvi S, Lauerma H, Helenius H, Saarihehto S. Seasonal affective disorders among rural Finns and Lapps. *Acta Psychiatr Scand*. 1999;99:95-101.
152. Hansen V, Lund E, Smith-Sivertsen T. Self-reported mental distress under the shifting daylight in the high north. *Psychol Med*. 1998;28:447-452.
153. Suhail K, Cochrane R. Seasonal variations in hospital admissions for affective disorders by gender and ethnicity. *Soc Psychiatry Psychiatr Epidemiol*. 1998;33:211-217.
154. Axelsson J, Stefansson JG, Magnusson A, Sigvaldason H, Karlsson MM. Seasonal affective disorders: relevance of Icelandic and Icelandic-Canadian evidence to etiologic hypotheses. *Can J Psychiatry*. 2002;47:153-158.
155. Nilssen O, Brenn T, Hoyer G, Lipton R, Boiko J, Tkatchev A. Self-reported seasonal variation in depression at 78 degree north. The Svalbard Study. *Int J Circumpolar Health*. 1999;58:14-23.
156. Takahashi K, Asano Y, Kobsaka M, et al. Multi-center study of seasonal affective disorders in Japan. A preliminary report. *J Affect Disord*. 1991;21:57-65.
157. Eagles JM, Mercer G, Boshier AJ, Jamieson F. Seasonal affective disorder among psychiatric nurses in Aberdeen. *J Affect Disord*. 1996;37:129-135.