

Seasonal Affective Disorder.

- Epidemiology
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- Review of Literature
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Introduction.

In the early 1980s, Herb Kern, a research engineer, who thought that his annual cycle of depression might be caused by the shorter and duller daylight hours in winter, approached doctors working at the National Institute for Mental Health in Bethesda, USA. They proposed a treatment where he was exposed to light, equivalent to summer sunlight, for several hours each day. By the fourth day his symptoms had virtually disappeared (Lewy et al 1982). This was the start of our acknowledging the condition that has come to be known as Seasonal Affective Disorder.

Seasonal affective disorder (SAD), or recurrent winter depression, is now considered a clinical subtype of major depression. The criteria for "winter seasonal pattern" in the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, which are similar to other definitions of SAD, specify a recurrent pattern of major depressive episodes during winter and remission of symptoms during summer, in the absence of seasonal psychosocial stressors.

Much of the interest in SAD has been stimulated by its response to exposure to bright artificial light. Clinical consensus guidelines have recommended light therapy as a first-line treatment for SAD (Lam & Levitt, 1999). Although light therapy may be regarded as a radical intervention for depression, in the case of SAD the rationale is rather commonsense.

Human beings are influenced by light. Light determines our sleep/wake cycle. In most animals and humans, the desire to sleep is brought on by the secretion of a hormone called melatonin. In the evening the pineal gland reacts to the diminishing levels of daylight and begins producing melatonin. melatonin is then released into the blood and flows through the body making us drowsy. Its secretion peaks in the middle of the night during our heaviest hours of sleep. In the morning, bright light shining into the eye reaches the pineal gland, which reacts by switching off the production of melatonin, thus removing the desire to sleep.

The pineal gland communicates with the rest of the hormonal system. Consequently melatonin production also influences the functioning of other parts of the body. During darkness and sleep, melatonin modifies the secretion of hormones from organs such as the pituitary gland, the 'master gland' of the hormonal system. The pituitary in turn regulates the secretion of hormones controlling growth, milk production, egg and sperm production. It also regulates the action of the thyroid gland, which is concerned with metabolism, and the adrenal glands, which control excretion of the body's waste. Further, it has been shown that light also effects levels of serotonin and dopamine neurotransmitters. The latter are connected with the Limbic system and the hypothalamus, which effects mood, emotion and autonomic systems, such as digestion. Therefore, fluctuations in light and darkness according to the seasons of the year influence rhythms of growth, reproduction and activity in animals and humans alike.

Statistics show that despite living and working in closed structures, our bodies still respond to the external environment and to its seasonal variability in duration and intensity. Studies have shown that growth rates in children are affected by the seasons. For example, surveys carried out in Germany, Sweden and Scotland show that height and weight increase is more predominant in the

spring and early summer (Smyth, 1990). In many countries the rate of conception peaks in the summer when the hours of daylight are longest. In numerous trials the seasons have been seen to influence the timing and duration of sleep, pain threshold, alertness, eating habits, mood, the onset of menstruation and sexual activity.

It is generally assumed that millions of years of evolution and adaptation have optimised human biochemical and physiological systems for function and survival under equatorial environmental conditions. Modern humans began their migration out of Africa only about 150,000 years ago. Little change in our 'equatorial' systems might have been expected over this relatively short evolutionary time-span. Susceptibility to seasonal changes in mood and behaviour (that are found to extremes in SAD) may reflect a genetic predisposition to an insufficient adaptation to temperate and high latitudes (Sher, 2000).

Unfortunately, research has not yet been able to find a definitive aetiology for seasonal affective disorder (Lam & Levitan, 2000; Lee et al 1998a; Mersch et al 1999; Sato 1997). Hormonal dispositions can explain perceived phenomena, yet, the systems involved are too complex to fully understand and thus predict cause and affect. Recent research has shown that SAD may be due to retinal sensitivity (Lee et al 1997), though more work needs to be done in this area.

Symptoms of Seasonal affective disorder.

There are four classic symptoms experienced by SAD sufferers.

- Extreme fatigue and lack of energy.
- Greater need for sleep and sleeping more than usual.
- Changes in appetite, especially cravings for carbohydrates and sweets, which can often lead to weight gain.
- Depression.

Further, there are a number of other symptoms, which may be experienced by some sufferers.

- Mood - sufferers tend to feel sad and low. They're often less interested in life and find it difficult to cope with everyday tasks. They may be irritable and short with friends and colleagues.
- Sleep - sleep disturbance is common in SAD but varies from case to case - feeling excessively sleepy during the day is a common feature, and sleep is less satisfying.
- Anxiety - tension, inability to cope with stress, phobias.
- Loss of libido - decreased interest in sex.
- Menstrual difficulties - pre-menstrual tension may be worse.
- Feelings of hopelessness.
- Increased sensitivity to pain - headaches, muscle and joint pain.
- Other physical ailments - constipation, diarrhoea, palpitations.

Studies have shown that a large percentage of any given population, above or below 30 degrees of the equator, notice seasonal changes with regard to the above symptoms, to some degree (Rosen et al, 1990; Palinkas, 1996). This suggests that SAD is just one end of a spectrum of disorders, ranging from mild up to increasingly problematic symptoms (Kasper et al, 1989). People who suffer a milder form of the above symptoms are said to have 'sub-syndromal' SAD or S-SAD.

Epidemiology of SAD & S-SAD

Despite minor differences, research from different parts of the world has shown that SAD strikes regardless of race, class or occupation (Han et al, 2000; Ozaki et al, 1995; Smyth, 1990). It is generally believed that the most common ages of onset are in the twenties and thirties, however, cases of childhood SAD have been reported (Rosenthal et al, 1986; Swedo et al, 1995) and successfully treated (Swedo et al, 1997; Giedd et al, 1998). In addition, Low & Feissner (1998) investigating prevalence of SAD in college students found prevalence rates for SAD (13.2%) and sub-SAD combined (19.7%), these are broadly in line with other population estimates. They also

found that the prevalence of SAD was higher in females, which was consistent with findings from previous research.

Extensive research in Northern Europe, Scandinavia, North America, Canada, Australia, the Soviet Union and Japan has shown that between 5-10% of the population (30' above or below north or south of the equator) suffers from severe SAD symptoms. An overview of epidemiological research by Magnusson (2000) revealed that the prevalence estimates of SAD across 20 retrospective studies varied from 0% to 9.7%. All prospective population studies, except one, found seasonal variations in mood/depressive symptoms usually peaking in winter. In addition to those who suffer from full-blown SAD it is believed that a further 25% of the population suffer the milder, yet still problematic form of the illness, S-SAD. For example in a random telephone survey of the general population of Maryland USA, Kasper et al (1989) reported that 92% of the survey subjects noticed seasonal changes of mood and behaviour to varying degrees. For 27% of the sample, seasonal changes were a problem and 4.3% to 10% of subjects (depending on the case-finding definition) rated a degree of seasonal impairment equivalent to that of patients with seasonal affective disorder. It is apparent from this study that seasonal affective disorder represents the extreme end of the spectrum of seasonality that affects a large percentage of the general population. Clearly, for every individual with full-blown SAD, there are many more with milder "Winter Blues".

Latitude

Many studies in the United States have reported a significant effect of latitude on prevalence, with an increase in prevalence with increasing latitude. Rosen et al (1990) working in Alaska, found a SAD rate of 8.9% and a subsyndromal SAD rate of 24.9%. Mersch et al (1999) Investigated the relationship between the prevalence of seasonal affective disorder and latitude and found the mean prevalence of SAD to be two times higher in North America compared to Europe. A significant positive correlation was found between prevalence and latitude in North America. For Europe there was a trend in the same direction. Rosen et al (1990) surveyed three geographic areas (New Hampshire, New York, and Florida) and resurveyed one (Maryland) to compare symptomatic seasonal changes in mood and behaviour at four different latitudes. Rates of winter SAD and SSAD were found to be significantly higher at the more northern latitudes. A population survey of seasonality in six representative cities in Japan revealed significant regional differences in seasonal variations of mood, length of sleep, and weight. The proportion of individuals reporting high seasonality in the two northernmost cities was significantly higher than that in the other areas (Okawa et al, 1996). Magnusson (2000) also found that SAD was more prevalent at higher northern latitudes, but that the prevalence varied across ethnic groups. In the southern hemisphere, work in New Zealand and Australia has shown a similar effect of latitude.

It is assumed that the incidence of SAD increases with increasing latitude up to a point, but does not continue increasing all the way to the poles. There seems to be interplay between an individual's innate vulnerability and degree of light exposure (Mersch et al, 1999). For example some individuals who work long hours inside office buildings with few windows may experience some symptoms all year round. Some very sensitive individuals may note changes in mood during long stretches of cloudy weather.

Sex

Seasonal affective disorder afflicts both sexes, though virtually all studies of the prevalence of SAD report that women are more likely to suffer than males. The most widely reported statistic is that women are 3.5 times more likely to present symptoms of SAD. However such results may be confounded, for example, more females might seek help than males. Academic studies have varied quite significantly in estimations of male to female ratio. Lee & Chan (1998) Pooled the epidemiological data reported in 40 studies on seasonal affective disorder to identify the male/female ratio. They concluded that about 70-80% of individuals with SAD are women. Among the 1,129 Ss (aged 28.7 - 47.0 yrs) recruited for these 40 studies, females out-numbered males 3.45 to 1. More recent work by Lam & Levitt (1999) however argues that the average ratio across all studies is closer to 1.8 to 1. A sex difference in biochemical responses to climatic variables is postulated as one of the possible explanations of the observed females' increased vulnerability to seasonal affective disorder. Partonen (1995) suggests that the mechanism may involve the action

of the ovarian steroid hormones oestrogen and progesterone. Again, the reasons for differences in vulnerability by sex are unclear since the aetiology of the condition is poorly understood.

Age

Epidemiological studies report that the lifetime prevalence of SAD increases with age until the sixth decade. After the age of 50-54 the prevalence declines dramatically, such that the prevalence of SAD over 65 is very low. Nonetheless, patients over 65 may still present to clinics for treatment and clinical experience suggests their response to treatment does not differ from that of younger patients with SAD.

Other considerations

The recall of lifetime episodes of seasonal depression is affected by the time of year the interview takes place; that is, patients interviewed during autumn or winter are more likely to report lifetime seasonal difficulties as compared to patients interviewed in the summer (Lam & Levitt, 1999).

A study carried out in the UK showed a prevalence rate of SAD was calculated to be 2.4% according to the strictest DSM IV criteria (American Psychiatric Association, 1994). The majority of identified cases had not previously received a diagnosis of SAD from their general practitioner, although over half had been diagnosed with other forms of depression and had been prescribed antidepressant medication. Therefore although SAD was found to be common in the general population sample it appeared to be largely underdiagnosed and/or misdiagnosed (Michalak et al, 2001).

One USA study, which used a structured diagnostic interview, reported that SAD patients were more educated than non-SAD patients, and that it was more common in rural settings. However, a Canadian study, which used a similar diagnostic interview, found no urban-rural or educational effects.

Light Therapy.

It is frequently argued that since many of us work in artificially lit buildings we are seldom exposed to sufficient light. The human visual system adapts rapidly to changing intensities of illumination; consequently light encountered outdoors may not be perceived as orders of magnitude brighter than indoor illumination. Physiologically however, humans respond quite differently to the higher levels of illumination provided by exposure to sunlight. Most artificial lighting cannot replace the natural light. The reason for this is that the type of indoor lighting used is not of sufficient intensity to affect the hormonal mechanisms which control bodily rhythms. Intensity of light is measured in units called lux. One lux = the light received by the receptor at an intensity of one lumen per square meter. Thus the intensity of light at any point therefore is determined not only by the strength of the illumination source but also by how far it is from the source. The electric light used in most homes and workplaces rarely exceeds 500 lux. A sunny afternoon could be as much as 100,000 lux, even the cloudiest day is rarely below 10,000 lux.

The therapeutic use of light in SAD arose from basic research showing that exposure to room light (less than 500 lux) could alter circadian and seasonal rhythms in animals. Kripke et al (1978; 1981) had proposed circadian-rhythm hypotheses for nonseasonal depression and first published reports showing that bright light exposure could improve mood in patients with depression. It is assumed that the major circadian effects of light therapy, also called light treatment or phototherapy, are mediated via suppression of nocturnal melatonin secretion. In 1980, Lewy et al demonstrated that higher intensity light (>2,000 lux) was required to suppress human melatonin secretion. This observation led to the first controlled study of light therapy in SAD (Rosenthal et al, 1984).

The efficacy of light therapy was clearly apparent, however, many sufferers found it difficult to allocate the four hours everyday that was needed for the light therapy to be effective. Additional studies were conducted to determine an optimum light therapy. It was found that, with a 10,000-lux light, sufferers only required 30 minutes of exposure per day to get effective alleviation from symptoms. However, the amount of light needed varies widely from individual to individual. The light treatment is most often done in the morning, but studies have suggested that either morning

or evening light can help SAD (Terman et al 1998), though some patients suffer insomnia when they use the light in the evening.

Early light-therapy used special full spectrum lights, (so as to mimic sun light). More recently Lee et al (1998a) suggested that light of short to medium wavelengths (blue/green/yellow) seem to be essential for the therapeutic effect of light on SAD. Red wavelengths were relatively ineffective. Furthermore, ultraviolet (UV) waves do not seem to be essential for SAD symptom alleviation by artificial light. Therefore, the potentially harmful UV waves should be blocked in any clinical application of phototherapy for SAD. Recent studies suggest that regular fluorescent lights will work as well as full spectrum, allowing UV light (which can damage eyes and skin) to be filtered out. Studies show that it is advisable to buy a commercially built light box to ensure the correct amount of light and to reduce isolated "hot spots" which could damage the eyes (Lam & Levitt, 1999).

The most studied light device is the fluorescent light box. The fact that the light box has proven effective in almost every study, regardless of sample size, has placed the light box as the "gold standard" light device. Other light devices include head mounted units, or incandescent light visors. Studies of the head mounted units have shown good clinical response rates (comparable to those of light box studies) but the bright light conditions were no better than dim light, putting into question whether visors are superior to placebo. Dawn simulators are devices that slowly increase the room illumination while subjects are sleeping, to simulate a "summer dawn" during the winter. Early results suggest a beneficial effect of dawn simulators in SAD, but other studies show superiority of light boxes over dawn simulators. Although efficacy has not been established for head mounted units and dawn simulators, these devices may be helpful for some patients when light boxes are not available or not convenient. SAD symptoms typically begin to lift about a week after the start of light therapy. But they return shortly after discontinuing the treatment. As a result, experts urge people with SAD and S-SAD to persist with their treatment throughout the winter months

Effectiveness of light therapy

Several qualitative reviews have concluded that light therapy is an effective treatment for SAD, with response rates of 60% to 90% in controlled studies (Eastman et al 1998; Lamberg, 1998; Partonen & Lonnqvist, 1996; Tam et al, 1996). It has been found that between 75-85% of people suffering from SAD and SSAD feel better after 3-4 days of consistent light therapy. Some individuals feel better immediately after their first dose, even within 20 minutes of exposure, while others may need several days (Terman et al, 1998). Two meta-analyses also confirm the efficacy of light therapy against plausible placebo controls (Terman et al, 1989; Lee & Chan, 1999). In a longitudinal study of light therapy patients Graw et al 1997 found that over a number of years, the clinical diagnosis changed for the better in 64% of the patients, and that light therapy reduced the incidence and depth of subsequent depressive episodes. Further evidence for this was the large reduction in use of conventional antidepressant drugs during the follow-up period. Sumaya et al (2001) found bright light treatment to be effective in the non-pharmacological treatment of depression among institutionalised older adults. Ibatoullina et al (1997) Presents a case report of a woman (46) with seasonal affective disorder without the typical depressed mood or lack of drive. The patient was given bright light therapy, and after 2 weeks of treatment, reported that her complaints had disappeared. The authors suggest that this case gives preliminary evidence that, even in the absence of depressive symptomology, patients can present with distinct atypical symptoms which may respond well to bright light therapy. Light therapy has been also found to be superior to conventional anti-depressants in the treatment of SAD, Ruhrmann et al (1998) investigated whether fluoxetine (Prozac™) has antidepressant effects comparable to bright light in the treatment of seasonal affective disorder and concluded that the remission rate in those patients using light therapy were far superior.

Light therapy for other conditions.

The treatment of SAD is almost exclusively associated with light therapy, in fact, it has been proposed that response to phototherapy may be a diagnostic criteria for SAD (Smyth, 1990),

however, as many as one-third of diagnosed SAD clients do not respond to light therapy alone (Ghadirian et al, 1998). In addition, there is evidence that bright light therapy is beneficial to other disorders, including non-seasonal depression, bulimia nervosa, premenstrual depression, and rapid-cycling bi-polar disorder (Avery & Norden, 1998; Blouin et al, 1996; Graw et al 1998; Jang et al, 1997; Lam et al, 1997; Murray et al, 1995; Wesson & Levitt, 1998).

Classical Depression.

Some psychiatrists are now suggesting that light therapy may be effective in treating nonseasonal, classical depression (Beauchemin & Hays, 1997; Benedetti et al 2001; McEnany & Lee, 1997) and patients in long term care (Lyketsos et al 1999). Daniel Kripke, MD, (director of the Circadian Pacemaker Laboratory at the University of California, San Diego) argues that light may produce antidepressant benefits within 1 week, in contrast to psychopharmacological treatments, which typically take several weeks. Indeed, a variety of studies have shown light therapy to be more effective in reducing depression than anti-depressants, though research is still in its relatively early stages. Wirz-Justice et al (1999) investigated the usefulness of light therapy in the setting of a psychiatric hospital, they found Daily self-ratings revealed positive effects of light (significant from day 5 onwards) with improved energy, sleep quality and shortened sleep latency with no change in sleep duration or the number of nocturnal awakenings. In a review of clinical trials, Kripke (1998) found that bright light therapy for nonseasonal major depression produced statistically significant net reductions in mood symptoms of about 12% to 35% on the Hamilton Depression Rating Scale. These results are comparable with those obtained in major trials of antidepressant medications. Light and medications appear to work best in combination, suggesting it would be advantageous to offer depressed patients speedy relief with light therapy while also starting them on medications that have more extensively verified efficacy. Combined treatment can lower costs because faster improvement means less disability and morbidity (Kripke, 1998).

Pre-menstrual syndrome (PMS)

Another possible application for light therapy is in the treatment of PMS. The symptoms of PMS are similar to those of SAD & S-SAD - depression, fatigue, irritability anxiety, over eating etc, and occur in women every month. Maskall et al (1997) suggest that patients with late luteal phase dysphoric disorder (LLPDD) have substantial seasonal patterns in mood and premenstrual symptoms. Lam et al (1999) found that bright light therapy significantly reduced depression and pre-menstrual tension scores during the symptomatic luteal phase. These results suggest that bright light therapy is an effective treatment for LLPDD. Further, studies have also shown that light therapy is effective in regulating women's menstruation cycles.

Sleep Disorders

Humans and animals generally have innate sleep-wake cycles close to but not exactly 24 hours. They depend on the daily light-dark cycle to keep their circadian rhythms to a regular 24 hours. If a human is left in a room with no light-dark cues, he or she will gradually shift into a sleep-wake cycle that is not exactly 24 hours long. Body temperature and the secretion of the hormone melatonin follow the daily cycle. Other factors, such as work schedule can modify the sleep-wake cycle in humans. The autonomous cycle length varies at different periods in the life span. Adolescents often have an innate cycle longer than 24 hours so that they have the desire to stay up late and sleep in when it is time to get up. The innate cycle then shifts closer to 24 hours for adults, but for the elderly, the autonomous sleep-wake cycle may be shorter than 24 hours resulting in evening tiredness, sleep difficulty and waking too early. Individuals who have more severe difficulty with the timing of their sleep-wake cycle may have either Delayed Sleep Phase Disorder (difficulty falling sleep and the urge to sleep late) or Advanced Sleep Phase Disorder (tiring too early and waking too early). Both conditions can be treated with bright light (Terman et al, 1995).

Healthy individuals

According to research by Partonen & Lonnqvist (2000) bright light improves vitality and alleviates distress in healthy people. Partonen & Lonnqvist exposed office employees to bright light during winter and found that repeated bright-light exposure improved vitality and reduced depressive

symptoms. The benefit was observed not only in healthy subjects with season-dependent symptoms but also in those not having the seasonal variation. Bright-light exposure during winter therefore appears to be effective at improving the health-related quality of life and alleviating distress in healthy subjects. It is suggested that administration of bright light is a useful option to improve vitality and mood particularly among those working indoors in wintertime.

In the case of jet lag the individual is reacting to externally induced changes in the sleep-wake cycle. Travelling west to east over three or more time zones is the most difficult shift. Large forced changes in the timing of sleep periods can lead to irritability and decreased alertness, several studies have shown that light therapy can be used very effectively to alleviate these symptoms (Smyth, 1990).

Shift workers often have symptoms of mild depression, fatigue, difficulty with sleeping and problems with attention and alertness. Studies have shown that these symptoms may also be significantly reduced through the use of light therapy (Czeisler et al, 1990; Stewart et al, 1995).

Side effects.

Potential side effects of light therapy are rare and most often include jitteriness, a feeling of eyestrain and headache. Light therapy, like antidepressant medications, occasionally will cause patients to switch into a manic state during which they may have difficulty sleeping, become restless or irritable, and feel 'speedy' or too high (Terman & Terman, 1999). According to Kogan & Guilford (1998) the most common side effects are headaches and eye or vision problems. In their study almost all side effects were mild, transient, and did not interfere with treatment. However they advocate that individuals taking certain medications such as Lithium, tricyclic antidepressants, and neuroleptics and individuals with conditions such as diabetes or retinal degeneration should be monitored by an ophthalmologist.

One of the symptoms of SAD & S-SAD is that the individual may experience period of mania during spring and autumn. They will feel anything is possible and will have a seemingly unlimited amount of energy. It is these individuals who are most prone to mania being a side effect from light therapy and should reduce their exposure time accordingly. There has been debate on whether there might be long-term retinal effects, associated with light therapy but none have been documented when lights with proper screening of UV wavelengths are used (Lee et al, 1998a). Some of the most common initial side effects of light therapy subside a few hours after treatment is finished and generally disappear altogether after several exposures. If, after four days, the irritation persists or becomes worse, the individual should sit a little further away from the light box, reducing their exposure. It should be noted that side effects from light treatment are not dangerous and are minimal when compared to the unpleasant side effects of antidepressant drugs (Terman & Terman, 1999). It has been found that people have their own individual thresholds for light therapy, and need to find their own particular threshold and stay within it during treatment. Because this form of treatment is fairly new, many doctors recommend a baseline eye exam and annual monitoring (Smyth, 1990).

If a person has an eye or skin condition, which is affected by bright light, they should consult a doctor before embarking on light therapy. If a person is suffering from disorders such as glaucoma, cataracts, retinal detachment, retinopathy, then they should not undergo bright light treatment. The bright light could worsen their eye problem or cause a rash in a skin condition. If they suffer from hypertension, diabetes or have any history of eye disease in the family, they should seek medical advice before commencing light therapy (Lam & Levitt, 1999).

Light therapy has been shown to be a successful, non-invasive therapy without significant side effects, within many spheres of our lives. Indeed, a Canadian study has revealed improvements in academic achievement, attendance records and growth rates in the classroom when children were treated with bright light. It also showed a reduction in tooth decay. Another study at Cornell University showed that working under very bright lighting helped to reduce perceptual fatigue. The positive implications and applications of light therapy are only just being recognised; it is clear that

in the future we will need to re-think how we use lighting within our schools, workplaces, hospitals and homes.

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