Some Effects of the Quality of Light on Health

Dr. A. Dunne, M.B.[1]

In November 1981 one of my patients described a peculiar cycle of symptoms. On weekdays she had migraines, physical and mental fatigue; on weekends her health was perfect. Exhaustive investigations of her physical and emotional background failed to provide any clues to her condition. Finally I visited the bank where she worked and was immediately struck by the off-putting effect of twenty double fluorescent tubes in an area the size of a large sitting room. A transfer was arranged to another branch with ordinary light bulbs and that was the end of her symptoms. Not long afterwards I had a chemical engineer who developed epileptic attacks when his office was modernized ... this too proved to be caused by the fluorescent lighting. Since then, cases of light-related illness with varying symptoms have come my way, including a fifteen year old boy who developed asthmatic attacks only when exposed to fluorescent lights in large stores or similar places.

According to Dr. Wilkins, Cambridge,[1] at least 15% of all office workers complain of eye strain under fluorescent lights. Cataracts and lens damage can develop from excessive unshielded fluorescent lights.[2] It also impairs the ability of children to achieve their academic potential.[3]

Adverse effects from inadequate natural light in winter have been proven in a variety of medical studies over the years since John Ott first published his findings in 1973.[4] Poor vitamin D formation impairs calcium absorption. National Institute of Health figures show 20 million Americans suffer from osteoporosis and 78 million more have calcium deficiency.

Tests conducted on volunteers for four weeks in a lightless environment showed a 25% loss of ability to absorb calcium. While symptoms of calcium deficiency are common knowledge it is often not appreciated that calcium also plays a vital role in the transmission of messages in the brain. The competence of the immune system is lowered in winter, thus impairing the natural defense mechanism of the body to all forms of stress, be it physical, mental or emotional. Fertility is lowered, fatigue increases and overall health levels decline. Body rhythms and hormone levels are altered and many women find an upsurge in PMT symptoms. Most people dislike the onset of winter ... they go to work in the dark, their days are spent indoors under artificial light and they return home in the dark. In cities, blankets of smog obscure what little light is available. Just one hour of outdoor winter daylight is more beneficial than 16 hours of normal indoor lighting. Glass blocks out the beneficial rays — the thicker the glass the more this pertains, and double glazing compounds the problem. Even ordinary spectacles block a considerable portion of light.

Although everyone is affected to some degree, certain people are plunged into deep depression at the onset of Autumn and remain so until Spring comes around again. Such people are suffering from what is now called *Seasonal Affective Disorder* or SAD. Only in recent years has SAD become recognized as a clinical entity. It is characterized by apathy, lethargy, excessive sleep, craving for sweet foods, weight gain, loss of libido, anxiety, loss of confidence, self-guilt and self-blame, irritability, social withdrawal, inability to handle stress, difficulty in making simple decisions and above all, depression varying from moderate to suicidal. The SAD syndrome is now included in psychiatric differential diagnosis and since 1980 has been included in *The Diagnostic and Statistical Manual of Mental Disorders* ... the handbook of the American Psychiatric

1. 43 Rathfarnham Park, Dublin 14.

Association. Detailed case histories of this condition are available from the British voluntary organization SADA[5] and its U.S. counterpart NOSAD. They have cassettes and videos available for radio and T. V. besides many stories that give hope to those who dread this annual depression.

In Ireland 200,000 people seek medical treatment for depression every year ... of these, 7000 suffer from SAD according to research by Dr. P. Carney, psychiatrist, Galway Regional Hospital, who described his findings at the 1988 meeting of the Royal College of Psychiatrists in Brighton. The figure may indeed be higher as the survey does not include the many depressed patients treated by general practitioners or not attending for any treatment.

Dr. Siegfried Kasper et al studied the incidence of SAD in Florida, New York city, New Hampshire and Maryland, and calculated from their preliminary estimate that 6.1% of the U.S. population suffer from SAD, and a further 14.3% from sub-syndromal SAD ... i.e. 'winter blues'. This figure is considerably higher than the figure of half a million SAD cases found by psychiatrists studying the British population.

The current theory behind the cause of SAD is based on the ebb and flow of a hormone, melatonin, in the body. The level of this hormone, many of whose functions are still obscure, varies directly with the amount of light entering the eyes. High levels are associated with the wide variety of adverse physical and mental effects ... i.e. it causes a photochemical response. Its secretion by the pineal gland is inhibited by sunlight. When light enters the eye, impulses are transmitted by two paths to the visual centre at the back of the brain and the hypothalamus at the base of the brain. From the latter, impulses are sent to the spinal cord in the neck and back to the pineal gland at the base of the hypothalamus, suppressing melatonin production. This relationship was established in 1980 by Dr. Levy of Oregon University Health Science Centre after three years studying melatonin levels in blood and urine and their relationship to light. As Director of the Mood Disorder laboratory in Oregon, he successfully treated a manic depressive who had severe depression in winter. At dawn and dusk the patient was exposed to three hours of high intensity light. After a few days his depression vanished and with its use he remained well throughout the winter season.

High intensity or full spectrum light has been used for years by horticulturists to promote better growth and quality crops, by farmers to increase milk production, and by poultry keepers to increase egg yield. Only in latter years is it being applied to humans. The Russians were early in the field, prescribing daily doses of full spectrum lighting for their workers.[6] Business organizations in America, England and Ireland have installed full spectrum lighting with resultant increased efficiency and improved morale. Several years ago one of my patients whose large export business operated in a basement premises in the city centre remarked on the regular deterioration of staff performance during winter months. I suggested substituting full spectrum lights for existing fitments and within a week optimal teamwork and production output was restored to summer levels. Many professional people are now realizing the benefits of this type of lighting in hospitals, schools and workplaces.

New techniques are constantly being developed to combat SAD. It is now possible to obtain various forms of artificial lighting which mimics sunlight to a degree sufficient to enable victims of SAD to maintain their summer personalities all year round.

The most basic device is a box which supports sufficient full spectrum fluorescent tubes (Trulite or Vitalite) to provide 2,500 luxes of light (Lux is a measure of light intensity). At present this costs £266.00 plus vat in England.[7] Running costs are low as the tubes last about six years. Ideally this apparatus is sited three feet from the patient who is advised to look directly at the light for thirty seconds every two minutes. Reflectors behind the tubes enhance the effect and a later type twist tube gives 10% extra light. The minimum daily exposure with this type is three hours ... most specialists prefer five hours. Some researchers use plastic filters which remove the ultra violet light. Dr. J. Docherty of Nashua Brookside Hospital,

New Hampshire, published his findings on both methods. While the filtered light relieved some symptoms of melancholy and mood changes, the unfiltered light was more effective for the typical SAD problems of fatigue, oversleeping and food binging. Opinions differ on which time of day is most beneficial to the patient ... most favour three hours in the morning and two hours in the evening to coincide with body's natural rhythms. Often, patients find their own optimal exposure time and periodicity on trial and error system. Experience shows patients with SAD respond to this treatment within four to five days and relapse if it is stopped. Dr. Alfred Lewy, University of Oregon, and Dr. David Avery, University of Seattle, both found two hour morning exposure was better than two hours in the evening ... except for a small group with abnormal circadian rhythm who benefited more from the reverse. Contrary to the above, Dr. Anna Wirz-Justice of Basle, Switzerland, found evening light as effective as morning light. Dr. C. Thompson, Dept. of Psychiatry, Charring Cross Hospital, and Dr. S. Checkley of Maudsley Hospital, both of London, who treat inpatients and outpatients for SAD, find both the above techniques effective. Dr. Charmaine Eastman of Chicago found that once light therapy is well established, some patients can omit it for a week or more without relapsing. SAD research is mushrooming in many parts of the world ... Dr. I. M. Mclntyre, University of Melbourne Psychiatric Department presented a paper on the successful treatment of SAD cases in September 1988 and the *American Journal of Psychiatry,* 145,4, April 1988 reports on SAD cases in India.

Exposure to the fixed box light for long periods has disadvantages for SAD patients such as mothers on the move all day, as well as those working away from home all day, so it is a natural progression to seek less anchoring treatment units. A bracketed light box of 10,000 lux — like a small white desk — can be angled in any direction to be slanted towards the user. Though it has not yet passed safety standards, this could reduce treatment to half an hour daily. Developed by Dr. M. Terman of New York, he has incorporated a 'dawn-dusk simulator' which increases the light intensity in the morning and decreases it in the evening. A folding briefcase type is transportable and can be plugged in anywhere ... it emits 2,500 lux. To make treatment more mobile and flexible for patients, psychiatrists headed by Dr. Rosenthal are currently trying out a new apparatus on six patients at the National Institute for Mental Health, Philadelphia. It comprises a welder's helmet with a portable light of two small fluorescent tubes attached beneath the helmet's brim at forehead level, projecting high-intensity light onto the face. A shoulder strap bag carries the necessary batteries. So far, five of the six patients have responded very positively.

However, the final answer to the light problem appears to be the Japanese development ... the Himawari[8] (i.e. *The Sunflower)* ... an exciting new light process devised by Dr. Kei Mori of Keio University, Tokyo in 1980. The idea is simple. Sunlight enters the collection system through a protective acrylic resin capsule. Inside the capsule hexagon honeycombed Fresnel lens capture incoming parallel rays. These are focused onto the highly polished input ends of fiber optic cables 4 mm wide set at the centre of the visible spectrum. The lens block off 60% of the infra red and most of the ultra violet light, and concentrates the remaining light by a factor of 10,000, which can then be delivered anywhere, even underground. A micro processor tracking system keeps the lens trained on the sun all day. The fiber optic cables can be wired like ordinary electric outlet wiring so that fixtures can be plugged into lighting outlets. Lamps are activated manually, by a timer, or by a sensor. This form of light is currently being applied in preventive and therapeutic medicine, treating depression, rheumatism and a host of other illnesses. It is also widely used in intensive horticulture. Indeed space programmes of the future may one day use it for growing food. The cost effectiveness of this system will determine its future. The fiber optic cabling is 50% or more of the total cost at present. The system provides more energy than it uses. Already, 79 systems are in use in private homes, schools, hospitals and nursing homes.

The Sunflower provides a new option for appropriating what is good in light energy and filtering out what may be harmful.

In view of this information on light quality, this winter I installed a home made apparatus delivering 2,500 luxes of light alongside the desk in my consulting room where I spend at least 6 hours daily. To my astonishment I developed a degree of physical and mental energy on a par with that normally enjoyed at the height of summer. Consequently I have now begun treating three cases of M.E. (post viral fatigue syndrome) with light therapy and await results.

There appears to be no doubt that some man made substitutes for natural light are a stress factor on the human body and can cause various forms of environmental illness. The growing awareness of this concept is epitomized in a statement from the *Journal of the American Institute of Architects* ... "Lighting must perform its aesthetic, biological, physiological and task functions as a first priority... the economics of energy conservation in user areas must come later. Lighting quality is a strong influence on the social, physiological, biological, and behavioural health of those who use an environment. To reduce quality for reasons of installation, maintenance, or running costs should be considered hazardous to the interests and health needs of the users. No economic evaluation of any new lighting system should ever be made without including social, physiological, biological, and behavioural factors in cost benefit analysis. Luminance is not enough."

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