



Expert sheds light on how and why artificial light can treat Seasonal Affective Disorder

By Jeffrey Penn

Speaker: Michael Terman, Professor of Clinical Psychology in Psychiatry, Columbia University

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Over the past decade, scientists have shed light—both metaphorical and literal—to combat the bleak midwinter blues that many people experience in the diminished sunlight of that long, gray season. Scientific experiments that expose clinically depressed patients to artificial, bright light have revealed impressive results, some rivaling or even exceeding traditional therapies, according to one of the nation's leading experts in the field.

"Although this field of study has been controversial, light treatment therapy for the seasonally depressed is an effective and important new tool for moving beyond standard psychopharmacology," said Michael Terman, Professor of Clinical Psychology in Psychiatry, Columbia University, during a February 10 lecture, "Seasonal Affective Disorder: How and Why it Responds to Light Treatment."

"We are beginning to understand how to manipulate moods by manipulating the physical environment, but there are still some loose ends to explore," Terman said, noting that experiments during the past 10 years have led to substantial progress "in the interface between clinical behavior and the internal biological clock."

Absence of light and 'winter depression'

According to Terman, the experiments have focused on patients diagnosed with Seasonal Affective Disorder, those who otherwise feel fine in the spring and summer, but who begin to sink into a depressive state as the sunlight diminishes

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summer, but who begin to sink into a depressive state as the sunlight diminishes in autumn, and who don't find their depression lifting until spring.

Early experiments with laboratory rodents indicated that nighttime light exposure could suppress secretion of the nocturnal hormone, melatonin. Researchers at the National Institute of Mental Health then performed human experiments with brighter light, with the same result, which they followed up by insightful extensions to depressed patients.

"Patients were sent home with a light box for a week, and almost immediately experienced dramatic improvement—for some, a complete remission of depressive symptoms," Terman reported. "These impressive results were a stark contrast to customary antidepressants which often take longer to work, since their effectiveness depends on slowly building up drug levels in the blood."

Refinements and additional exploration over time revealed that three variables contribute to effective results in treating winter depression with artificial light, including: 1) how much light reaches the eye, a function of light intensity and the distance between the patient and the light source, 2) the duration of the light treatment, and 3) the time of the day when it is applied. Terman reported that it took 10 years of study to understand the relationship of the three variables, and to adjust them in order to find the most effective treatment strategy.

Initial clinical trials exposed patients to the light for two to four hours each day. Over time, Terman and his colleagues adjusted the intensity of the light and were able to find the same effects after applications of only 30 minutes. In addition, it soon became clear that each patient required individual clinical tracking and manipulation of the three variables in order to get the best results. The data also revealed that the light treatment was more effective when applied in the morning than for any other time of day.

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What is the typical treatment?

Terman described the typical routine. "Apply the procedure immediately after waking up in the morning, before breakfast, for 30 minutes on-average." And he described the typical light source, "a filtered florescent light box that provides 10,000 lux at a comfortable seating distance. The box should be stationed above the head, out of the direct line of sight."

Terman accompanied his description with a visual image of a person sitting at a desk with the illumination at a downward angle of about 30 degrees, so that it doesn't shine directly into the person's eyes.

According to Terman, the intensity of such a light is "brighter than the typical light in homes," and akin to "the level of natural daylight on a beach about 40 minutes after sunrise." He added that such light intensity "is orders of magnitude higher

than moonlight, but still far lower than noontime light."

Terman said that, over the course of the decade-long series of studies, it turned out that the most important variable was the time of day when the light is applied. The researchers discovered that there is a relationship between effectiveness of such timed light treatment to the pattern of melatonin production in each patient's body.

According to Terman, melatonin is secreted by the pineal gland for several hours at nighttime during sleep, a period of time also known as the "subjective night." People follow their own "circadian rhythm," in which the subjective night begins with the onset of melatonin secretion in the evening. Secretion ends about seven hours later, and as the hormone washes out of the blood circulation, the body awakens from sleep. From one person to another, melatonin onset can vary as much as six hours within normal limits. "While everyone in a particular time zone lives under a common solar clock, the internal biological clock can diverge substantially earlier or later," he observed.

Further study indicated that patients with winter depression responded best to light treatments when it was timed relative to the onset of melatonin secretion. Thus, Terman reported, "We discovered that there is a relationship between the clinical effectiveness of light treatments and the patient's individual circadian rhythm."

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Treatment based on 'internal time clock'

According to Terman, the discovery of that relationship represented a significant breakthrough, because it meant that treatment should be "timed in relationship to the internal, biological clock, rather than external clock time."

Initially, calculations were based on melatonin levels measured in blood or saliva, Terman said. Recent research indicates, however, that melatonin levels in the body are closely correlated to some regular, identifiable sleeping patterns and daytime habits. Terman adapted a simple questionnaire to survey individuals and help them determine when light treatment should be scheduled. (The online survey is available at www.cet.org.) He said that the treatment strategy is based on an equation including melatonin levels, the proper illumination level and duration, and finally, the optimum time when the application of light should begin for each patient calculated on individual circadian rhythms.

"We found that there was an 80-percent chance of complete remission of depressive symptoms if the bright light is applied in the morning, between 7.5 and 9.5 hours after the onset of melatonin secretion," Terman reported. The online questionnaire closely predicts the melatonin pattern, he noted, making physiological measurements unnecessary.

With such a success rate, Terman predicted that increasing numbers of people with Seasonal Affective Disorder would seek light therapy and find relief from their winter doldrums. Additional research indicates a similar success rate for treating women suffering from antepartum depression, and even people with chronic and bipolar depression who show no seasonal pattern.

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Future treatments options

Terman reported that, in addition to the research on light treatments for depression, similar studies are underway on the effect of altering the air ions that surround people during sleep. Early research is promising, and Terman said that someday patients might be treated in their sleep with negative ionizers, grounded to the patient by way of specially designed conductive bed sheets.

Terman also expects continued improvements in treatment strategies that use light to relieve the bleak midwinter blues. Perhaps someday there will be light boxes available at a reasonable price, designed to adjust for each individual's dosing needs. For now, though, Terman cautions people against attempting to treat themselves with "full-spectrum light bulbs that are marketed at local hardware stores to improve mood. They can be ineffective and even pose an ocular hazard," he said. Given the complex variables in each individual case, Terman said that people who suffer from Seasonal Affective Disorder should seek professional assistance—perhaps crucial advice, since ineffective results would doubtfully improve anyone's mood.

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