Shedding Light on SAD: The Effects of Light Therapy in the Treatment of Seasonal Affective Disorder

Claire Kim* and Rayhan Pitigala*
*Interdisciplinary School of Health Sciences, University of Ottawa, Ottawa, Ontario, Canada

Abstract

Background: Seasonal Affective Disorder (SAD) consists of recurrent depressive episodes in the fall/winter with summer remission and symptoms that include hypersomnia, fatigue, increased appetite for carbohydrates, weight gain, and loss of interest in socialization. SAD patients also have significant morbidity and psychological impairment. Although SAD etiology is currently unknown, the estimated prevalence of SAD is 1.7-2.9% in Canada and 0.4-0.7% in North America. Most common in women of reproductive age, SAD prevalence increases with greater latitude. Light therapy (LT) is an effective first-line evidence-based treatment for SAD, although it presents economic and lifestyle burdens. There is a critical need to better understand and evaluate current LT application to determine an optimal treatment strategy for SAD in the future.

Methodology

“Seasonal Affective Disorder” AND “Phototherapy” OR “Light Therapy”

Background

First systematically described in 1984, Seasonal Affective Disorder (SAD) is a subtype of Major Depressive Disorder that consists of recurrent depressive episodes in the fall/winter with summer remission and symptoms that include hypersomnia, fatigue, increased appetite for carbohydrates, weight gain, and loss of interest in socialization. SAD patients also have significant morbidity and psychological impairment. Although SAD etiology is currently unknown, the estimated prevalence of SAD is 1.7-2.9% in Canada and 0.4-0.7% in North America. Most common in women of reproductive age, SAD prevalence increases with greater latitude. Light therapy (LT) is an effective first-line evidence-based treatment for SAD, although it presents economic and lifestyle burdens. There is a critical need to better understand and evaluate current LT application to determine an optimal treatment strategy for SAD in the future.

Objective

To explore the relevant literature regarding the efficacy and physiological impact of light therapy in the treatment of Seasonal Affective Disorder among the Canadian adult population.

Results

Table 1. Summary of analyzed Seasonal Affective Disorder (SAD) studies. The objective, sample size, study design, and key findings are listed in this table.

<table>
<thead>
<tr>
<th>Study</th>
<th>Objective</th>
<th>Sample Size</th>
<th>Study Design</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guran et al.</td>
<td>To determine whether LEDS are a more convenient and effective mode of LT for SAD than standard LightBox Therapy.</td>
<td>N = 23</td>
<td>Randomized, double-blind, placebo-controlled, multi-center</td>
<td>30 minutes of daily lightbox LED exposure is efficacious treatment of SAD. Mean SIGH-SAD scores were significantly lower for the experimental group than the control group.</td>
</tr>
<tr>
<td>Hsu et al.</td>
<td>To determine the influence of LT on depressive symptoms and its effect on people with mild to moderate seasonal depression.</td>
<td>N = 38</td>
<td>Cross-Over study</td>
<td>Three weeks of LT improved mood, but also slightly increased irritability and quiescence behaviors and decreased socialness.</td>
</tr>
<tr>
<td>Larenzo et al.</td>
<td>To investigate a biological effect of LT on the retina of patients with SAD.</td>
<td>N = 38</td>
<td>Clinical trial; retinal sensitivity measured by ENF</td>
<td>Patients with SAD showed significantly lower retinal sensitivity compared with healthy participants. After 4 weeks of LT, retinal function was normalized.</td>
</tr>
<tr>
<td>Song et al.</td>
<td>To investigate if the shorter photoperiods lead to an increase in SAD inducing, pro-inflammatory cytokines and whether LT will normalize these immune changes.</td>
<td>N = 41</td>
<td>Clinical trial</td>
<td>Inflammatory response in winter was higher in SAD patients. The short photoperiods worsen the induced inflammation, enhance inflammatory response and induces seasonal depression. LT normalized immune functions and depressive symptoms, suggesting immunomodulatory role of LT in SAD.</td>
</tr>
<tr>
<td>Tyurin et al.</td>
<td>To investigate the effect of LT on serotonin transporter binding in the anterior cingulate and prefrontal cortices in SAD during winter.</td>
<td>N = 11</td>
<td>Clinical trial; serotonin binding measured by PET</td>
<td>Winter increase in serotonin binding is a biomarker of SAD in the brain. Serotonin transporter binding was significantly reduced in the anterior cingulate cortex and prefrontal frontal cortex (most regulation regions of brain) following LT in SAD.</td>
</tr>
<tr>
<td>Westrin &amp; Lam</td>
<td>To investigate literature relating to the long-term and prophylactic treatment of SAD.</td>
<td>N = 46</td>
<td>Systematic review</td>
<td>Few studies study the effect of LT for more than 8 weeks (long-term treatment). Lack of evidence shows that a brief course of LT can prevent relapse, therefore LT should be continued throughout the winter season and discontinued during spring and summer.</td>
</tr>
<tr>
<td>Westrin &amp; Lam</td>
<td>To investigate studies relating to clinical management of SAD.</td>
<td>N = 68</td>
<td>Literature review</td>
<td>UADS ratio = 2.83 and effect size = 0.88 when comparing treatment response of LT vs. control group. LT Therapeutic onset is rapid (1-2 weeks), but may be longer for clear response. Most SAD patients relapse upon LT discontinuation.</td>
</tr>
</tbody>
</table>

Thematic Analysis

Light therapy is approx 3 times more effective than control treatment.

LT is acute treatment of SAD, and must be continued to avoid relapse of SAD symptoms.

Retinal LT normalizes retinal sensitivity in patients with SAD.

Neurotransmitter LT normalizes blood flow in the regulation brain regions.

Physiological side effects: headache, nausea, and eyestrain.

Behavioral side effects: elevated levels of irritability, agitation, and anxiety.

Conclusion

Though the efficacy of LT in treating SAD has been established, current research is aimed towards identifying physiological mechanisms to better understand and optimize targeted application of LT. This study examined the most current Canadian data to understand LT as the first-line treatment for SAD, which is a prevalent condition in Canada. We found that most of the Canadian research is focused on physiological implications, behavioural impacts, and efficacy of comparative modes of light therapy.

Future Directions

- Establishment of a conclusive pathophysiological mechanism for the etiology of SAD
- Identification of SAD incidence and morbidity statistics (QALYs, DALYs) in Canada, as well as other indicators and biomarkers for SAD diagnosis and progression
- Further links between LT effects and SAD symptomatology
- Comparative analysis of different LT therapies (LT vs. pharmacotherapy vs. cognitive behavioural therapy)
- Development of a standard for effective LT treatment (duration and intensity)
- Research on the long-term preventative applications of LT as well as optimal adherence and compliance

Acknowledgements

We would like to acknowledge and extend our gratitude to our professor, Dr. James Gomes; our TA, Alexander Moncrief; the Canadian Society for Epidemiology and Biostatistics; the Interdisciplinary School of Health Sciences at the University of Ottawa.

References

Ho, Y. Z., Mok, K. S., & Young, S. (2016). The influence of light administration on interpersonal behavior and effect in people with mild to moderate seasonal depression. Prog NeuroPsychopharmacol Biol Psychiatry, 63, 24-34. doi:10.1016/j.pnpbp.2016.04.012