Ameliorations in Both Mood and Subjective Sleep Following Light Therapy

An Open-Label Light Therapy Intervention Study
Past Research

- Small Sample Size
- Questionable Placebo
- Randomization not Specified
- Heterogeneity in Sample

Small-to-moderate effect in reducing symptoms as compared to control treatment

(Perera et al., 2016, BJPsych)
Possible Reasons?

Depressed Population
Depressed Vs. Healthy

Phase Delay

Sleep Onset Time

Control
Depression

24.5
23.5
22.5

Sleep Offset Time

Control
Depression

10
9
8
7

Sleep Efficiency (%)

Control
Depression

90
89
88
87
86
85
84

(Robillard et al., 2015, JPN)
Circadian Disruptions

Melatonin

- Healthy
- Depressed
Melatonin

B) Melatonin Circadian Phase

A) Depressive Symptoms

(Robillard et al., 2018, Frontiers in psychiatry)
The Impact of Light

Light

Suprachiasmatic Nucleus (SCN)

Output Rhythms: Physiology Behavior
The Impact of Light

![Graph showing the impact of light on melatonin levels during sleep and wake-up.](image-url)
Main Objective: to evaluate whether the antidepressant effects of light therapy in young people with depression are modulated by changes in the sleep-wake cycle

A) An improvement in mood will occur following light therapy

B) An improvement in depressive symptoms will correlate with an improvement in sleep (across time points)

C) Those with poorer sleep will demonstrate a greater reduction in depressive symptoms
Participants

Sex Distribution: 17% male

Age (years)
- Range [15-30]
- Mean (SD) 21.2 (4.9)

24 Participants:
- 12 from Brain and Mind Centre (Sydney)
- 12 from ROMHC (Ottawa)

Comorbidity (n (%))
- Anxiety Disorder (15 (63%))

Baseline BDI (measure of depressive symptoms severity)
- Means (SD) 23.4 (9.3)
  - Minimal depression: 0-14
  - Mild depression: 15-20
  - Moderate depression: 21-29
  - Severe depression: 30-63

Medication (n(%))
- Taking Psychotropic Medication (14 (58%))
Procedures

Light Therapy
- 60min – after sleep offset
- 500 nm dominant wavelength (UV-free)
- High setting – 506 Lux lm/m² & 230 µW/cm²
- Low setting – 315 Lux lm/m² & 143 µW/cm²
- Light Pulse – 50 to 166 Hz

Baseline (Week 0)
Follow-up 1 (Week 2)
Follow-up 2 (Week 4)

Questionnaire
Questionnaire
Questionnaire

2 weeks
2 weeks
2 weeks
• **Beck Depression Inventory-II (BDI)**
  - One of the most frequently used tools to assess depression severity

• **The Glasgow Content of Thoughts Inventory (GCTI)**
  - Characterises the content, character, and intrusiveness of cognitions occurring prior to sleep initiation
  - Indicate the frequency of each ‘thought’ using the following answer key: Never, Sometimes, Often, Always.

• **Leeds Sleep Evaluation Questionnaire (LEEDS)**
  - Used to track changes in sleep quality
  - Sub categories - initiating sleep (GTS), general sleep quality (QOS), the ease of waking up in the morning (AFS), and the quality of wakefulness (BFW)
**LEEDS Questionnaire**

<table>
<thead>
<tr>
<th>Question</th>
<th>-scale</th>
<th>Description</th>
<th>Code</th>
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</thead>
<tbody>
<tr>
<td>How would you describe the way you currently fall asleep in comparison to usual?</td>
<td></td>
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<tr>
<td>1. More difficult than usual</td>
<td></td>
<td>Easier than usual</td>
<td>GTS</td>
</tr>
<tr>
<td>2. Slower than usual</td>
<td></td>
<td>More quickly than usual</td>
<td></td>
</tr>
<tr>
<td>3. I feel less sleepy than usual</td>
<td></td>
<td>More sleepy than usual</td>
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<tr>
<td>How would you describe the quality of your sleep compared to normal sleep?</td>
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<td>4. More restless than usual</td>
<td></td>
<td>Calmer than usual</td>
<td>QOS</td>
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<td>5. With more wakeful periods than usual</td>
<td></td>
<td>With less wakeful periods than usual</td>
<td></td>
</tr>
<tr>
<td>How would you describe your awakening in comparison to usual?</td>
<td></td>
<td></td>
<td>AFS</td>
</tr>
<tr>
<td>6. More difficult than usual</td>
<td></td>
<td>Easier than usual</td>
<td></td>
</tr>
<tr>
<td>7. Requires a period of time longer than usual</td>
<td></td>
<td>Shorter than usual</td>
<td></td>
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<tr>
<td>How do you feel when you wake up?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Tired</td>
<td>Alert</td>
<td></td>
<td>BFW</td>
</tr>
<tr>
<td>How do you feel now?</td>
<td>Alert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Tired</td>
<td>Alert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How would you describe your balance and co-ordination upon awakening?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. More disrupted than usual</td>
<td></td>
<td>Less disrupted than usual</td>
<td></td>
</tr>
</tbody>
</table>
A) An improvement in mood will occur following light therapy
   • BDI (mood) - Repeated measures t-test

B) Improvements in depressive symptoms will correlate with improvements in sleep (across time points)
   • Correlations between the % of change in depressive symptoms and sleep from baseline (Week 0) to follow-ups (Week 2; Week 4)
     • Early Intervention; (Week 0 – Week 2)/Week 0 *100
     • Later Intervention; (Week 2 – Week 4)/Week 2*100

C) Those with poorer sleep will demonstrate a greater reduction in depressive symptoms
   • Correlations between sleep scores at baseline (Week 0) and % of changes in depressive symptoms from baseline (Week 0) to follow-up (Week 4)
     • Whole Intervention; (Week 0 – Week 4)/Week 0 *100
A) An increase in mood did occur following light therapy.
B) Improvements in depressive symptoms did correlate with improvements in sleep initiation and pre-sleep thoughts.
B) Improvements in depressive symptoms did correlate with improvements in daytime functioning ($r = -.712, p = .003$)
C) Those with poorer sleep prior to light therapy did have a greater reduction in depressive symptoms.
• **A) Change in mood and sleep from pre- to post-treatment**
  - Significant improvements in mood start appearing after 4 weeks of treatment

• **B) Potential mechanisms explaining the antidepressant effects of light therapy**
  - Early intervention (first 2 weeks): improvements in mood correlate with an ease to fall asleep and reductions in unhelpful thoughts at pre-sleep
  - Later intervention (last 2 weeks): improvements in mood correlate with a reduction in daytime symptoms of sleep disruptions

• **C) Treatment response profile**
  - Whole treatment (all 4 weeks): better mood was found in those with initially more difficulties falling asleep and staying asleep
Phase I: Open Label Study (Completed)
- Both researchers and participants know what treatment is being administered

Phase II: Randomized Control Trial (In Progress)
- Participants are randomly assigned to an experimental or control group
- fMRI; Genetics; Circadian Measures
Thank you!