DARK-ADAPTED RODS DO NOT SUPPRESS MESOPIC FLICKER DETECTION

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Purpose and Rationale
- Previous study showed that dark adapted rods suppress MC pathway mediated flicker detection (Cao et al., 2006).
- If rod and cone share neural pathway via the rod-cone gap junction, we would speculate that dark-adapted rods would also suppress rod flicker detection under mesopic light level.
- To investigate whether dark-adapted rods suppress mesopic rod flicker.

Apparatus

A 2-channel 4-primary photostimulator can independently control excitations of the rods and 3 type of cones (L, M, and S) (Pokorny, Smithson & Quinlan, 2004)

Stimuli and Procedures

Spatial

3 Modulation Conditions:
- Isolated rod (R)
- Isolated cone luminance (L+M)
- Combined rod and cone (R+L+M)

Modulation Contrast: 30%

Temporal

- Observer adjusted temporal frequency to determine Critical Fusion Frequency (CFF).
- CFF was measured following 30 min dark adaptation.

Surround Illuminance

<table>
<thead>
<tr>
<th>Surround Illuminance</th>
<th>Center Illuminance</th>
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<tbody>
<tr>
<td>0 Td</td>
<td>2 Td</td>
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<tr>
<td>0.002 Td</td>
<td>200 Td</td>
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<tr>
<td>0.02 Td</td>
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<td>0.2 Td</td>
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<td>2 Td</td>
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<td>20 Td</td>
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<td>200 Td</td>
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Anatomy: Rod Pathways

Rod signals are convey via
1. Rod bipolar pathway
   - Slower
   - Activated at scotopic level
2. Rod-cone pathway
   - Faster
   - Activated at scotopic and mesopic level
• Isolated rod CFF stayed approximately constant at all surround illuminance.

• At low illuminance surround, the reduction in CFFs was about 3-10 Hz.

• Weak or no suppression is observed at 20 Td for cone or combined modulation.

• At 2 Td center illuminance, no suppression is observed.
Summary

- There is no suppression on Rod modulation at all light levels or Cone modulation at 2 Td.
- There is suppression on Cone modulation at 20 or 200 Td.

Discussion

- Dark-adapted rods only suppress cone but not rod flicker detection at 20 and 200 Td.
- At high mesopic light level (200 Td), rod signals are likely to be transmitted via the rod-cone gap junction pathway.
  - Rod IRF might be too weak to be suppressed.