Effects of Dim Phase Light Intensity Modulation on Circadian Rhythms in Syrian Hamsters

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What is a circadian rhythm?

- Latin: *Circa* = about *diem* = day
- An internal "clock" controlled by the suprachiasmatic nucleus (SCN)
- This "clock" is not exactly 24 hours and must be reset daily

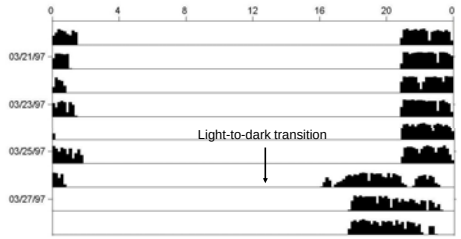
Introduction

Nonphotic stimulation induces arousal in animals and resets circadian clocks. It is known that maximal phase advances in circadian locomotor activity in *Mesocricetus auratus* are produced by stimuli at Zeitgeber time (ZT) 4.5. Previous studies have shown that dim illumination during the activity phase (BD) produces larger phase shifts than complete darkness during the activity phase (LD) when animals are subsequently transferred to complete darkness during the middle of the light phase (ZT 4.5). The purpose of this study is to examine whether level of dim illumination during the activity phase modulates nonphotic phase shifts and other circadian related behaviors such as overall activity levels and the time of nightly activity onset relative to the time of bright-to-dim transition (i.e., phase angle of entrainment).

Methods

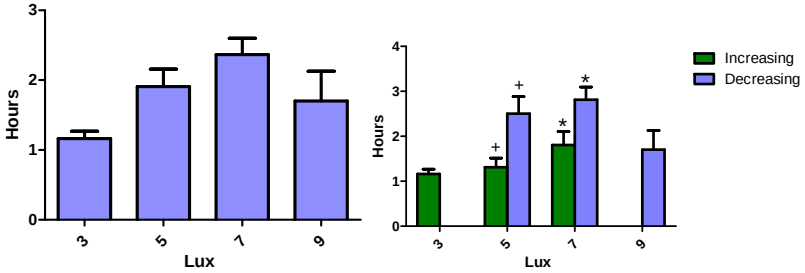
- The circadian activity of each hamster (all males) was measured with an exercise wheel in its cage. Revolutions were recorded automatically by computer.
- Animals were kept on a cycle of 14 hours bright light (300 lux) and 10 hours dim light.
- After 14 days in each lighting condition, animals were transferred to complete darkness at ZT 4.5 (7.5 hr prior to time of daily bright-to-dark transition). Clock resetting was assessed over the next 2.5 days in darkness.
- One group of animals were exposed to increasing dim light intensity every 14 days; another group started with a high dim light intensity which was decreased every 14 days.

What does clock resetting look like?

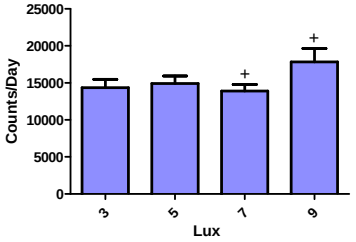


Results

Increased Dim-Phase Light Intensity Increases Clock Resetting



Dim-Phase Light Intensity Has Little Effect On Locomotor Activity



Conclusions

1. Increased dim-phase light intensity increases clock resetting in response to a light-to-dark transition in in the middle of the bright phase. However, increased dim-phase light intensity does not decrease expression of locomotor activity.
2. More analysis is needed to determine whether dim-phase light intensity affects phase angle of entrainment.

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