4-17-2020

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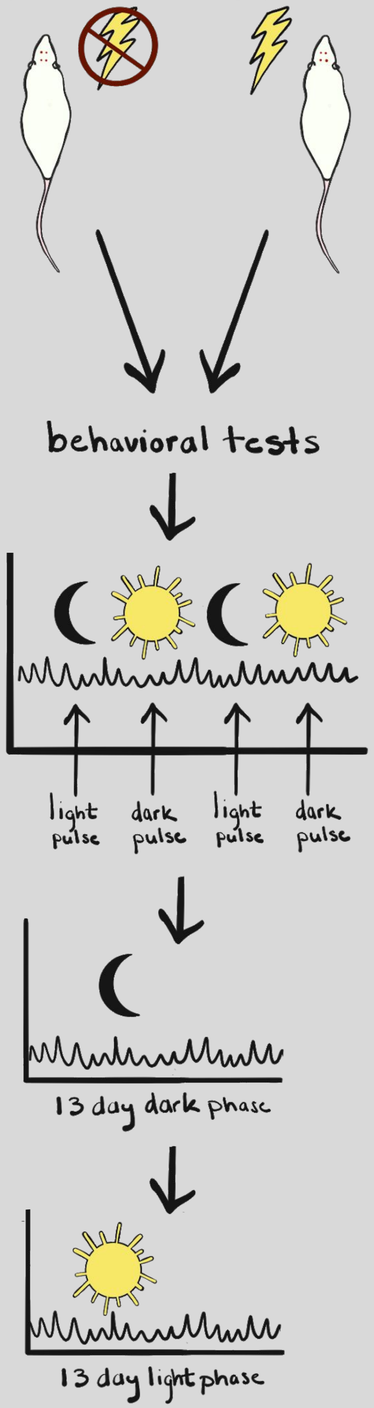
Methods

Fig 1. Overview scheme of project method



Introduction

- Light influences multiple aspects of life including mood, activity-level, stress-level, and circadian rhythms[1].
- Exposing nocturnal rodents to light stimuli amidst their nocturnal active phase attenuates their activity levels[3]. It was shown that the superior colliculus (SC) was particularly active during this process, and that ablation of it severely affected this response.
- The retinofugal pathway modulates light effects on activity levels and circadian rhythms. This pathway connects the retina to the suprachiasmatic nucleus, geniculate complex, pretectum and SC[2].
- Recent research showed that the SC is critical to maintaining normal activity responses to light in diurnal species[3].
- Even though it is known that the SC relays visual stimuli into other CNS structures and shares connections with the circadian system[3], it is unclear whether the SC also helps regulate circadian rhythms and wakefulness by means of relaying visual stimuli.

The superior colliculus may play a role in risk-taking behavior and sensitivity to light in rats, which suggests the SC may help regulate activity patterns in response to light.

References

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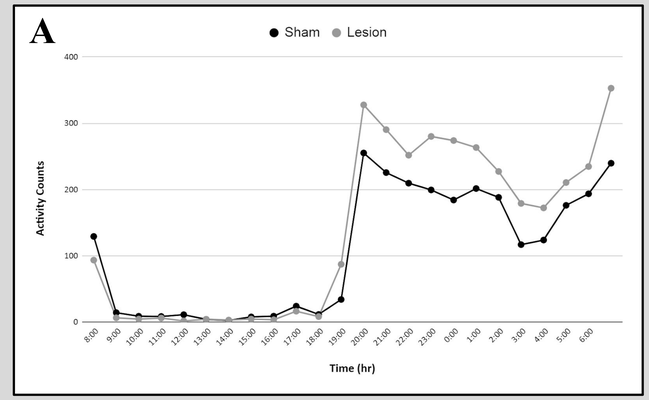
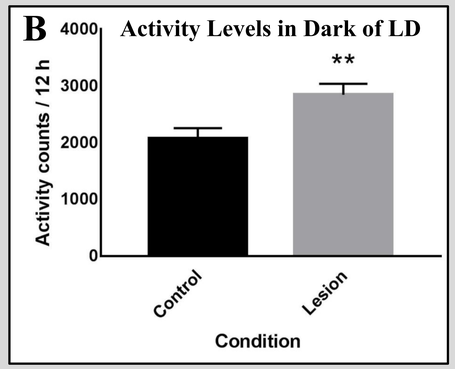
2. Morin, L. P., & Studholme, K. M. (2014). Retinofugal projections in the mouse. *Journal of Comparative Neurology*, *522*(16), 3733-3753.
3. Gall, A. J., Goodwin, A. M., Khacherian, O. S., & Teal, L. B. (2019). Superior Colliculus Lesions Lead to Disrupted Responses to Light in Diurnal Grass Rats (Arvicanthis niloticus). *Journal of Biological Rhythms*

Acknowledgements

This research was generously supported by the Hope College Neuroscience Program. The assistance of the Hope College animal care committee helped to make this study possible.

Results





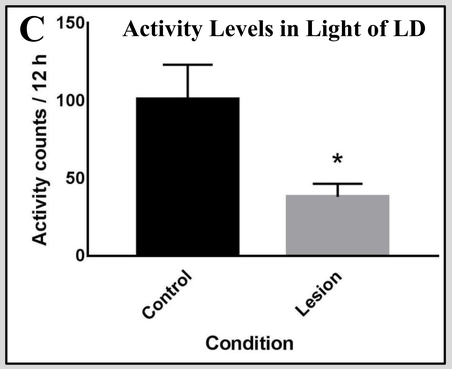


Fig 2. **A.** quantified line plot comparing mean activity counts between sham and lesion groups on an LD schedule 24h period. **B.** Comparison between groups for mean quantified activity during 12h dark phase of the LD period showed that lesion group (M= 2845) was significantly more active than sham group (M= 2073; p= 0.01, t= -2.902, df= 16). **C.** Comparison between groups for mean quantified activity during 12h light phase of LD period showed that lesion group (M= 38) was significantly less active than sham group (M= 101; p= 0.018, t= 2.641, df= 16).

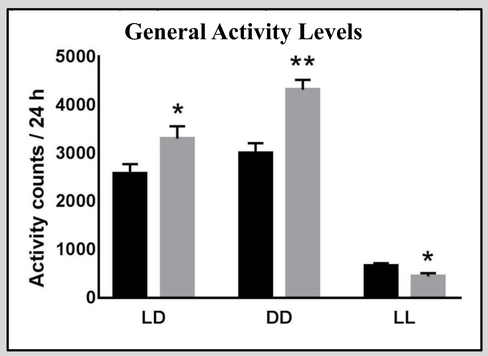


Fig 3. Mean differences of activity counts during LD, DD and LL between SC lesion group (Means= 3304, 4316, 442, respectively) and control group (Means= 2577, 2999, 665, respectively). The lesion cohort was significantly more active than the control group (p=0.037, t=-2.269, df=16) in LD. In DD, the lesion cohort was also significantly more active than the control group (p=0.0, t=-4.529, df=16). In LL, the sham group was significantly more active than the lesion group (p=0.022, t=2.534, df=16).
**significant at a 95% confidence level*
***significant at a 99% confidence level*

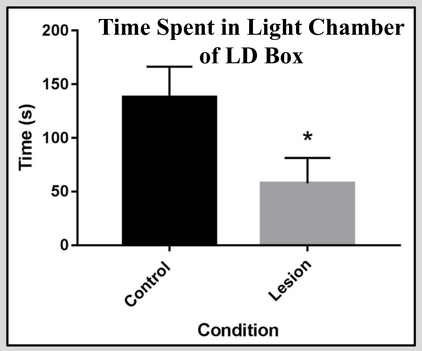


Fig 4. Mean differences in mean combined times spent under light between the lesioned (M = 57.756s, SEM = 23.739s) and the control (M = 137.93s, SEM = 28.542s) groups. Lesioned animals spent a significantly reduced amount of time in the light chamber compared with controls (t(16) = 2.160, p = 0.046). The lesioned group (M = 4.78) showed significantly reduced entries to center dim (t(16) = 2.382, p = 0.030) compared to the sham group (Mean = 8.89). A significantly reduced time spent in center dim (t(16) = 2.128, p = 0.049) was observed for lesioned animals (M = 30.08s) compared to the sham group (M = 59.50). *Significantly different from lesion and control.*