

INJURY-INDUCED LOSS AND RECOVERY OF FUNCTION IN MALE ZEBRA FINCH: THE EFFECTS OF LESION ON SONG, GROOMING, AND AGGRESSION

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INTRODUCTION

Research on targeted neuronal death has shown that lesioning the higher vocal center (HVC) severely impairs song production in male zebra finches, with some recovery of function over time. It is not known if other mating behaviors such as aggression and/or grooming are affected. Our study will lesion the HVC to determine whether song is the only mating behavior lost and recovered. While the HVC is the major region of interest, a number of other sites will be lesioned as surgical controls, including the hippocampus (HP) and the hyperstriatum accessorium (HA). We hope to chronicle the process of functional recovery, note environmental correlates, and compare the effects of lesions on mating-related behaviors.

METHODS

- Seventy male zebra finches will be pair housed in same-sex cages. To stimulate mating behaviors, each male cage will be placed between two female cages, then videotaped during three 15-minute observations over seven days to obtain baseline measures of singing, grooming, and male-to-male aggression.
- Birds will then receive, bilaterally, either an HVC, HP, HA, or sham lesion.
- Three post-lesion observations will be conducted over the next seven days, with the exception of half of the sham birds and half of those with HVC lesions. These birds will be observed for an additional 23 days to assess possible recovery of function.



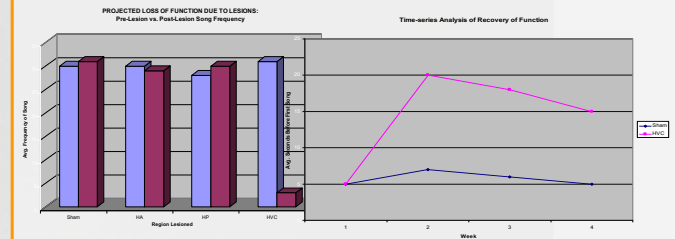
Behaviors Measured

Latency to first song
Singing bouts
Grooming self
Cleaning own beak
Grooming other male
Peeks
Chasing
Beak fencing

Groups

Group	Pre-lesion Observations (2 per week)	Lesions	Post-lesion Observations (2 per week)	Post-lesion
HVC 7 day	Week 1	Higher vocal center (HVC)	Week 2	One week Post-lesion
HP 7 day	Week 1	Hippocampus (HP)	Week 2	One week Post-lesion
HA 7 day	Week 1	Hyperstriatum Accessorium (HA)	Week 2	One week Post-lesion
Sham 7 day	Week 1	No lesion (sham)	Week 2	One week Post-lesion
HVC 30 day	Week 1	Higher vocal center (HVC)	Weeks 2 - 4	One month Post-lesion
Sham 30 day	Week 1	No lesion (sham)	Weeks 2 - 4	One month Post-lesion

RESULTS



HYPOTHESIS 1: Loss of function will only occur after HVC lesion

HYPOTHESIS 2: HVC-lesioned birds will recover song function in a time-dependent manner

HYPOTHESIS 3: We do not expect to observe any changes in pre- vs. post-lesion aggression or grooming behavior. However, if changes are observed, these measures can serve to signal global changes in the brain after lesion.

This data may also be used to:

- Assess if the extended absence of female exposure between observations serves as a motivational factor, decreasing latency to sing
- Male-to-male aggression driven by song competition (exposure to challenge from other male's song repertoire, song frequency, etc.)
- Determine time-series trends of sham bird behavior (e.g., decreased latency or frequency) due to learned associations

CONCLUSIONS

The current study targets brain injury in the HVC, HP, and HA and hopes to determine the specific and non-specific behavioral impact. Examining functional loss and recovery as well as the temporal and environmental influences of functional changes may lead to a better understanding of the factors involved in human recovery from brain injury.

- Limitations of the current study include the confounding of time with the repairing of neuronal damage as well as the unknown influence of associative learning on mating behavior.

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