

Ketterson / Nolan Research Group Collection

This document is part of a collection that serves two purposes. First it is a public archive for data and documents resulting from evolutionary, ecological, and behavioral research conducted by the Ketterson-Nolan research group. The focus of the research is an abundant North American songbird, the dark-eyed junco, *Junco hyemalis*, and the primary sources of support have been the National Science Foundation and Indiana University. The research was conducted in collaboration with numerous colleagues and students, and the objective of this site is to preserve not only the published products of the research, but also to document the organization and people that led to the published findings. Second it is a repository for the works of Val Nolan Jr., who studied songbirds in addition to the junco: in particular the prairie warbler, *Dendroica discolor*. This site was originally compiled and organized by Eric Snajdr, Nicole Gerlach, and Ellen Ketterson.

Context Statement

This document was generated as part of a long-term biological research project on a songbird, the dark-eyed junco, conducted by the Ketterson/Nolan research group at Indiana University. For more information, please see IUScholarWorks (<https://scholarworks.iu.edu/dspace/handle/2022/7911>).

License/Disclaimer Statement

By downloading this document or using any information contained therein, you agree to the license terms outlined at <https://scholarworks.iu.edu/dspace/handle/2022/15256>, which explain terms governing use, creation of derivative research, and requirements for citing the document.

#646.6

EXPERIMENTAL MANIPULATION OF TESTOSTERONE DURING THE BREEDING SEASON INFLUENCES THE SONG SYSTEM OF MALE DARK-EYED JUNCOS.

J.M. Casto^{1*}, T.V. Smulders², T.J. DeVogd³, V. Nolan Jr.¹, & E.D. Ketterson¹.

¹Dept. of Biology, Indiana University, Bloomington, IN USA, ²Dept. of Neurobiology, Duke University Medical Center, Durham, NC USA, ³Dept. of Psychology, Cornell University, Ithaca NY USA.

Introduction

Testosterone influences the neural circuitry necessary for learning and production of song in songbirds. In free-living, intact, adult male dark-eyed juncos (*Junco hyemalis*), experimental, breeding season-long elevation of testosterone (T) leads to more frequent singing (see fig 1), larger home ranges, and increased success in gaining extra-pair fertilizations.

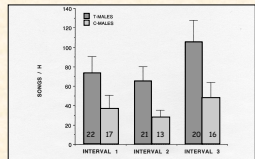
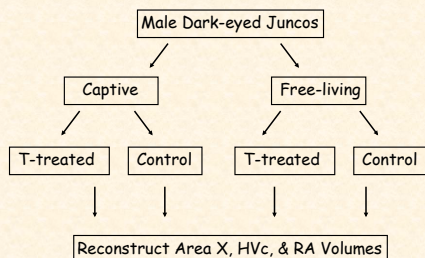


Figure 1: Effect of testosterone treatment on song rate (mean ± SE) in free-living males. Intervals are thirds of the period between hatching and day 10 of nesting life. Sample sizes are shown at base of bars (from Ketterson et al. 1992).

Specific Aim

The specific aim of the present study was to test whether experimental alteration of T-titers in free-living and captive intact male juncos would influence the volumes of area X, HVC, and RA.

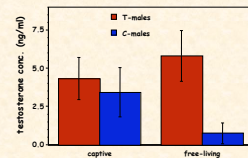


Study Population

- Mt. Lake Biological Station, Giles County, VA
- During the 1997 breeding season
- Free-living males from a long-term study site
- Captive males from a nearby site

Hormone Manipulation

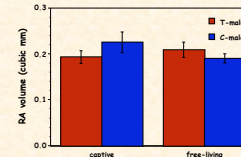
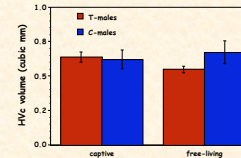
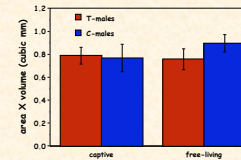
- two 10 mm Silastic implants, either filled with crystalline T (T-males) or left empty (C-males)
- T implants were designed to maintain springtime peak in plasma T throughout the breeding season
- Yoked design: duration of implants was identical within each pair of captive and free-living males
- Implant duration ranged from 37-107 days



- Significant effect of hormonal treatment ($p < .05$)
- No significant effect of living condition
- No significant interaction between the two



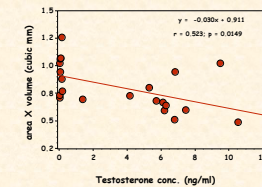
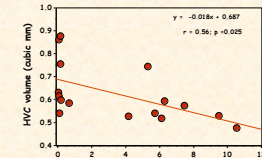
Volume Reconstructions



- No significant effect of hormonal treatment
- No significant effect of living condition
- No significant interaction between hormonal treatment and living condition
- Male age and brain collection date were analyzed as covariates, but neither accounted for significant variation.



Testosterone, HVC Volume, and Area X Volume



Implications

- Previous research has demonstrated that seasonal changes in song control region volume track seasonal changes in circulating androgen levels in free-living juncos (Gulledge and Deviche, 1997).
- Additionally, castration reduces HVC and area X volume by 36% and 31%, respectively. Androgen replacement blocked these volume decreases (Gulledge and Deviche, 1997).
- Taken together with the results of previous studies, our results suggest that the song system reacts differently to T administration when males are gonadally intact as opposed to castrated and that area X and HVC volumes may be unrelated to song frequency.

We thank the following for support of this research:

