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Investigating Auditory and Visual Seasonality in House Finches

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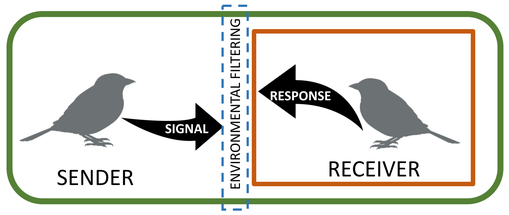
Introduction

- Animal communication is important for reproduction and survival.



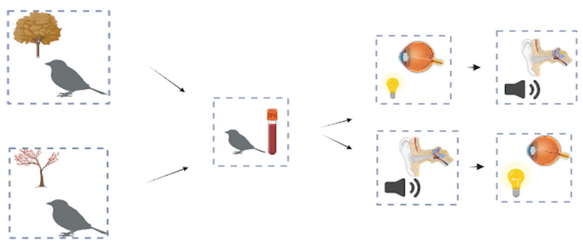
- Many songbird species display differences in visual displays as well as auditory signals across seasons.

Image from Cornell Labs

- Differences in auditory and visual displays play an important role in the mating process.
- House finches are a sexually dimorphic songbird, meaning that there is a difference in appearance between the sexes. The difference in appearance makes it likely that vision plays a primary role in the mating process.
- Seasonal plasticity among male and female house finches were shown to have a higher reaction to sound during the breeding season in both male and female organisms (Groof, et. al 2009).

Methods

- Trapping of birds from rural and urban locations around the Holland, MI area
  - One group of 22 birds in the fall and one group of 22 birds in the spring (half male, half female)
- Birds given about a week to acclimate to the aviary environment.



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<u>Research Question:</u> How do seasonal changes affect multimodal sensory processing in house finches?

<u>Predictions:</u> Multimodal sensory processing will be heightened in the spring due to mating season. We expect the visual and auditory processing abilities to increase with heightened levels of sex hormones (e.g. estrogen and testosterone) and the greater increase will be seen in females.

Expected Results

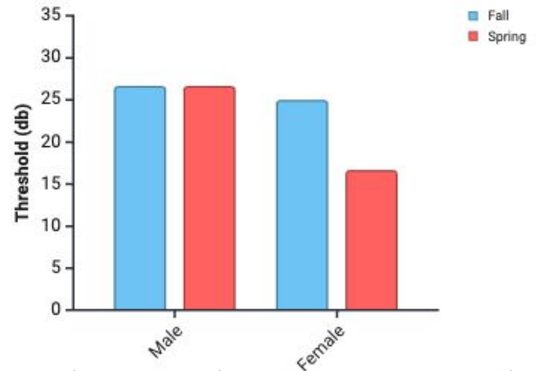

Figure 1: Seasonality of the Auditory Threshold of House Finches. This graph depicts how seasons affect the auditory ability of house finches, The average threshold of male house finch hearing shows no significant change between the fall and spring. However, females have increased audition in the spring due to breeding season. (Created with BioRender.com)

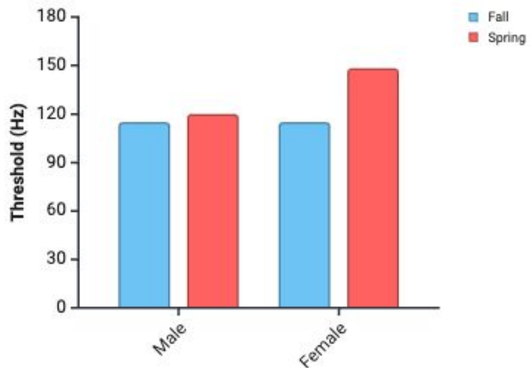

Figure 2: Seasonality of the Visual Threshold of House Finches. This graph depicts how seasons affect the visual aspect of house finches between spring and summer. The average threshold where a male house finch can differentiate between flashes of light does not greatly differ between seasons. The females show increased ability to differentiate flashes at higher frequencies in the spring due to breeding season, (Created with BioRender.com)

Discussion

- One study found that house finches, both male and female, are more likely to have an increased ability to detect sound during the summer months compared to that of spring (Groof et. al 2009).
- We predict that our future results will demonstrate heightened multimodal sensory processing during the spring mating season vs the fall non mating season.
- Previous research in the Ronald Lab found that female house sparrows had increased auditory acuity during their breeding season but the males didn't show significant variability.
- The house finches have shown certain adverse reactions during testing and we have been unable to determine yet whether the anesthetic use, testing protocols, or some other factor is causing this.

Image from https://www.abc27.com/digital-originals/did-you-know-these-birds-are-most-commonly-found-in-pennsylvania/

Image from https://jaysbirdbarn.com/house-finch/

Future Research

- Exploring differences in multimodal sensory processing seasonally between male and female house finches.
- Comparing differences in multimodal sensory processing seasonally in other native songbird species.
- Exploring how the variations in testosterone/estrogen levels across birds in the same season group affect their multimodal sensory processing abilities.
- These variations could also impact the male plumage/song construction which could potentially change female behavior in response.
- Urbanization effects on multimodal sensory processing.

References

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Acknowledgements

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