Antidepressants as a Tool to Modulate Vocal Plasticity

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Introduction

- Humans are vocal learners: we learn vocalizations by listening to and imitating a tutor.
- As humans, our ability to learn languages decreases with age.
- Current research asks what factors contribute to the decrease of vocal plasticity with age[1].

Why use zebra finches as a model?

- Like humans, zebra finches are vocal learners and their ability to learn song decreases with age[2].
- Therefore, they are a good model to study vocal plasticity.

Antidepressants modulate plasticity

- Antidepressants increase the amount of serotonin in the brain, a neurotransmitter often implicated in plasticity.
- Administering fluoxetine, a generic antidepressant, to older rodents increases plasticity in the visual sensory system.

Question: Do antidepressants increase vocal plasticity in older zebra finches?

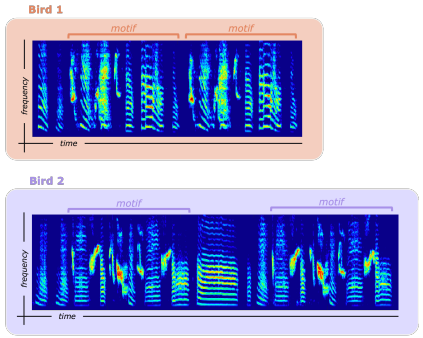

Fig. 1: example spectrograms from two birds

Methodology

- Round 1 experimental set up: 10 male zebra finch birds with distinct songs are housed in pairs. One bird in each pair is administered fluoxetine, the other a vehicle solution.
- The bird's songs are recorded at regular intervals during drug administration and spectrograms are created using custom lab software.
- Various bioacoustic analyses are used to assess similarity between bird songs.

Results

Hypothesis: fluoxetine will increase song plasticity in older zebra finches.

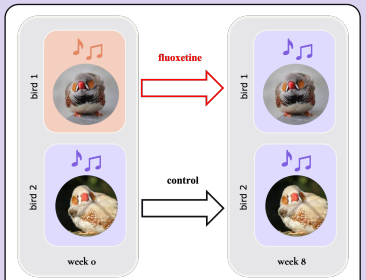

Fig. 2: round 1 experimental setup and expected results

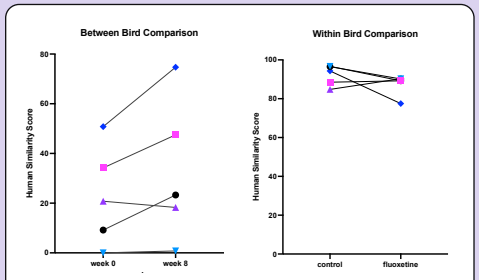

Fig. 3: Human similarity scores of between and within bird comparisons

Preliminary data from a human similarity exercise is consistent with the hypothesis

<u>Between bird comparison</u>

Song similarity between the fluoxetine bird and control bird will increase over time.

<u>Within bird comparison</u>

Songs of fluoxetine birds will be less similar overtime then songs of control birds.

Future Directions

- We are continuing this pilot project with more rounds of birds in different experimental set ups.
- In addition to the human similarity analysis, we will conduct other similarity measures using lab software to strengthen our conclusion.
- The effect of fluoxetine on other features of birdsong, such as fundamental frequency, is being investigated.
- Finally, we are investigating how fluoxetine affects neurobiological markers of plasticity, specifically perineuronal nets and parvalbumin positive interneurons.

References & Acknowledgments

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