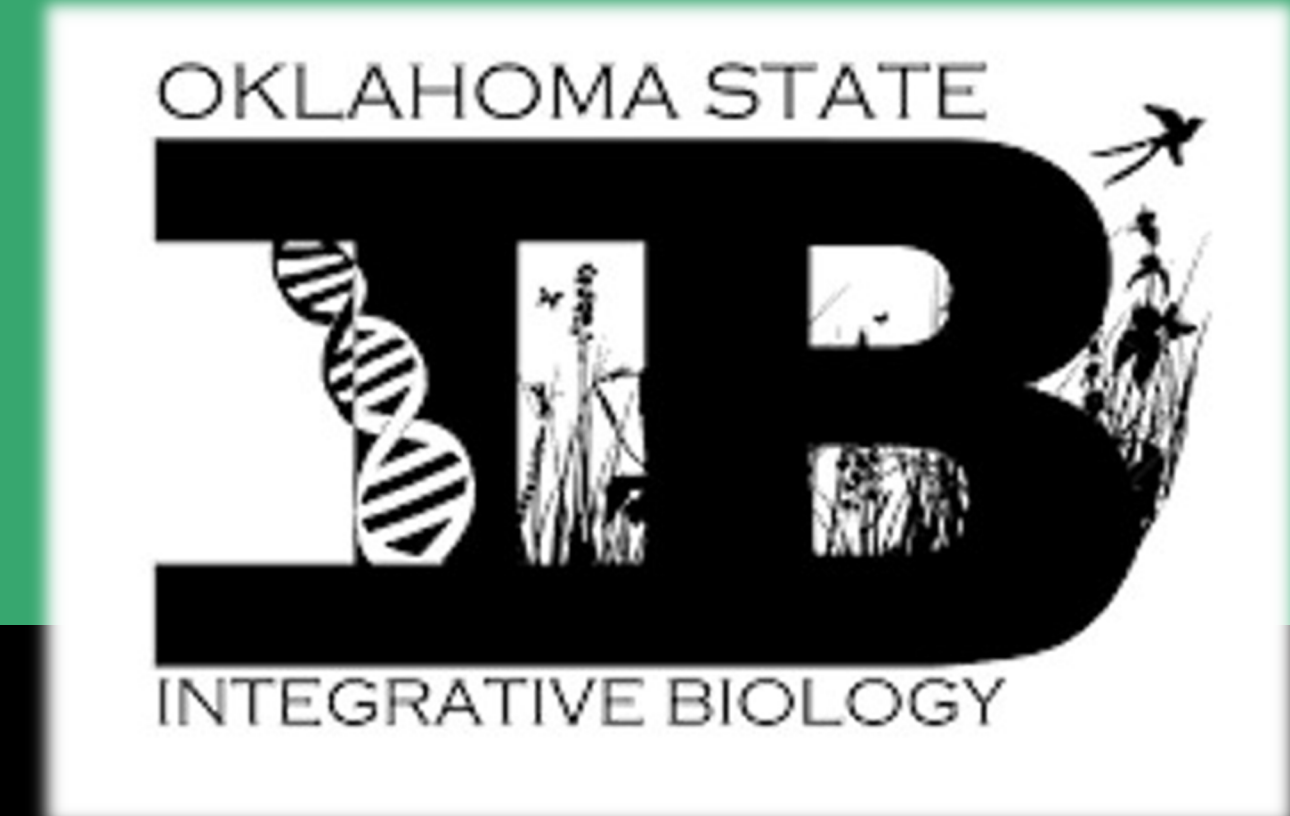




# Exploring the Winner-Loser Effect on Emotion in Crickets



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## INTRODUCTION

- Emotions are short-term internal states caused by external stimuli [1].
- Experiences affect an individual's emotional state differently depending on whether the event is categorized as positive or negative.
- Emotional states can then influence future behaviors.
- Experience winning or losing a fight (winner-loser effect) could lead to "optimistic" or "pessimistic" behaviors [2].
- **Does experience in an aggressive fight cause changes in emotional states and affect behavior in other contexts?**

## OBJECTIVE

- Determine if the winner-loser effect can cause different emotional states in house crickets (*Acheta domestica*) and observe how the emotions affect another behavior, exploration tendency.
- **We predict that winning a fight will increase a cricket's exploration tendency, while losing a fight will decrease its exploration tendency.**

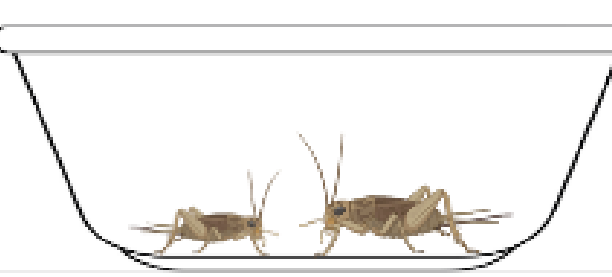
## METHODS

### Trial 1 & 2



Exploration tendency measured as the latency time needed for cricket to exit the shelter.

### Aggression Contest



Each cricket experienced winning or losing a fight by randomly assigning focal individuals with larger or smaller opponents.

### Trial 3



Exploration tendency measured after fight to test if winners responded differently than losers.

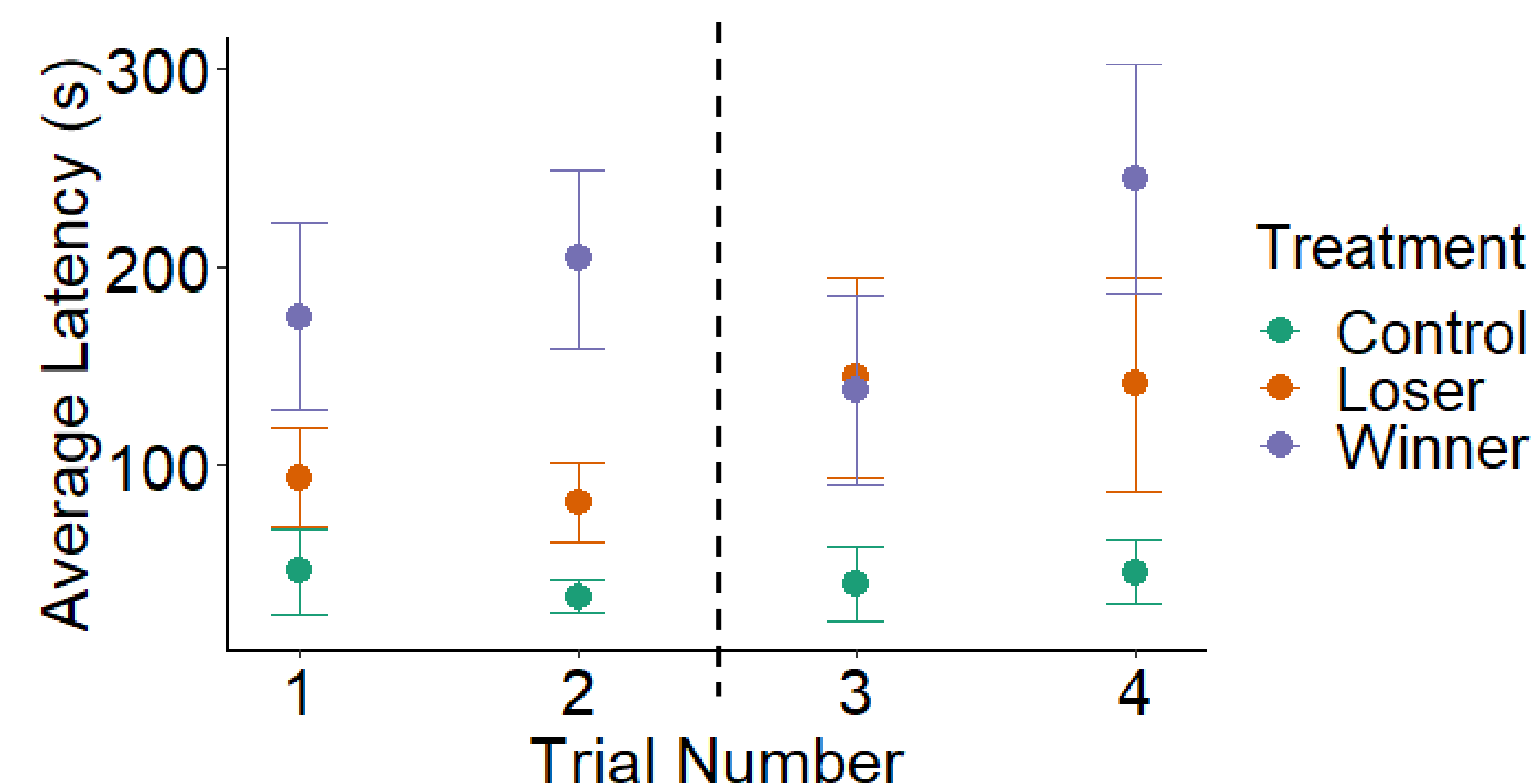
### Trial 4



Exploration tendency measured 48 hours post-contest to determine if winner-loser effect persists over time.

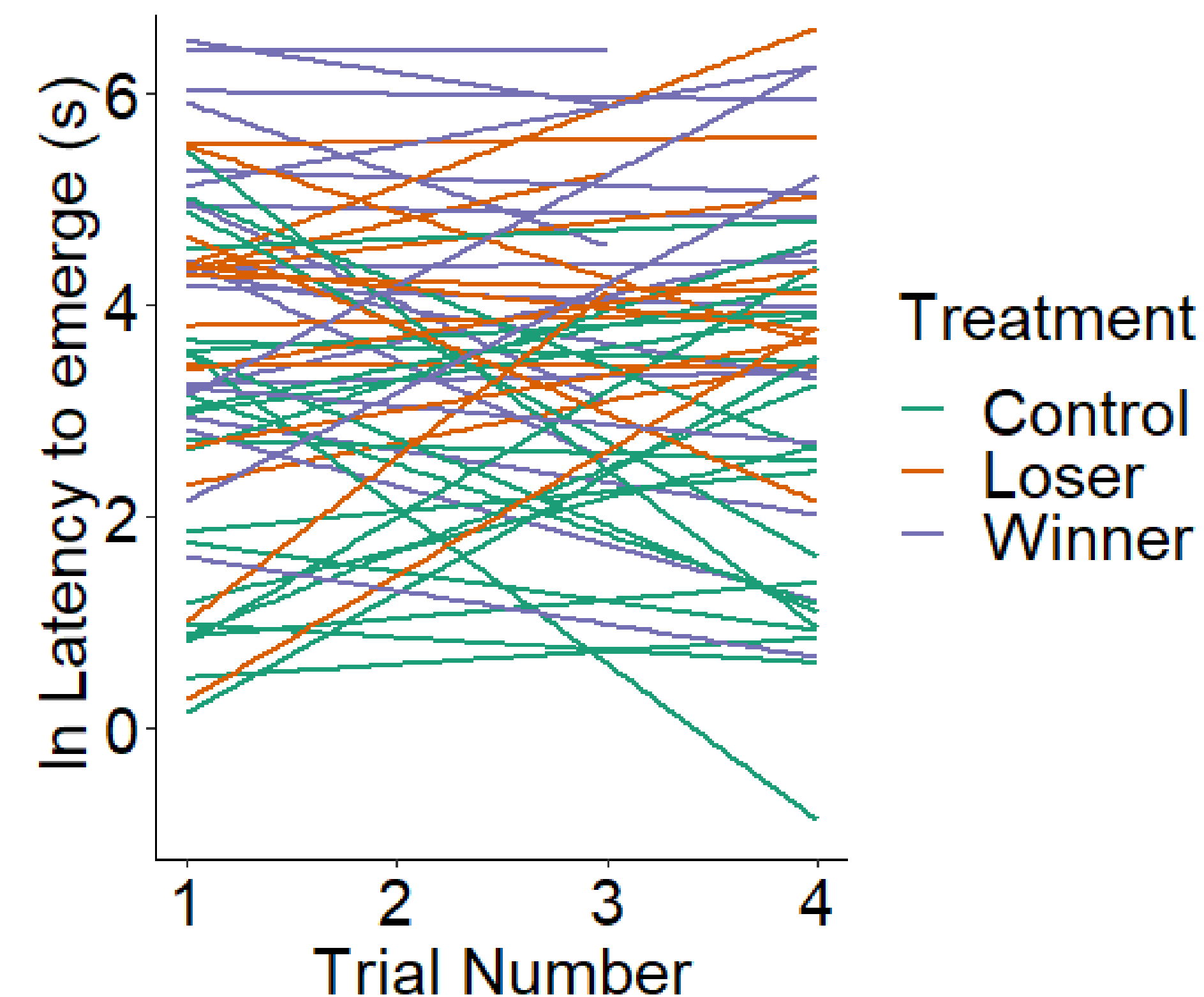
## RESULTS

Winning crickets exhibited increased exploratory behaviors after the fight, while losing crickets showed decreased exploratory behaviors.



**Figure 1. Effect of treatment and trial number on average latency to emerge from the shelter.** There was a significant interaction between trial number and treatment ( $t = -2.931$ ,  $p = 0.006$ ). Winners ( $n = 20$ ) decreased in average latency from trials 2 to 3, while losers ( $n = 17$ ) increased in average latency. Control individuals ( $n = 20$ ) did not exhibit a difference in average latency time ( $t = 0.06$ ,  $p = 0.95$ ) across trials. There was a significant interaction between squared trial number and treatment ( $t = 2.963$ ,  $p = 0.0044$ ): winners returned to pre-fight behavior in trial 4, while losers continued to show an effect of the contest experience.

Although exploration tendency is affected by experience, there were repeatable differences among individuals.



**Figure 2. Effect of treatment and trial number on individual latency to emerge from the shelter.** Each line represents an individual. There was significant repeatability for latency to emerge ( $R = 0.45$ ,  $CI [0.24, 0.63]$ ,  $p = 0.000145$ ).

## CONCLUSION

- ***A. domestica* do exhibit different emotional states caused by the winner-loser effect.**
- **Exploration tendency was affected by the change in emotional state of the cricket.**
- Winning crickets displayed "optimistic" behaviors because their exploratory tendencies increased after the fight.
- Losing crickets displayed "pessimistic" behaviors because their exploratory tendencies decreased after the fight.
- Crickets were assigned to treatments randomly, but differences in their latencies were evident even before the contest experience. However, the fight still caused a change in average latency.

## FUTURE DIRECTIONS

- Crickets' simple neural architecture provides opportunities for examining the mechanisms underlying changes in emotional states.
- Further experiments on crickets could result in data for the helpful manipulation of human mental states through advanced therapeutic techniques and drugs.
- Other repeatable behaviors may be investigated to determine if emotional states are specific in the contexts they affect.



## REFERENCES

- [1] Perry, C.J., & Baciadonna, L. (2017). Studying emotion in invertebrates: what has been done, what can be measured and what they can provide. *J. Exp. Biol.*, 220, 3856-3868.
- [2] Crump, A., Bethell, E.J., Earley, R., Lee, V.E., Mendl, M., Oldham, L., Turner, S.P., & Arnott, G. (2020). Emotion in animal contests. *Proc. R. Soc. B*, 287, 20201715.
- Cricket on white background. (2021). World Republic News. Retrieved 2022, from <https://worldrepublicnews.com/cricket-facts-how-to-get-rid-of-crickets/>.

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