The "*buzz*" on virtual fencing:
Livestock response to audio cues and electrical stimulation

Kendall Hays[1], Alayna Gerhardt[1], Federica La Manna[1], Dr. Ryan Reuter[1], Dr. Laura Goodman[1], Dr. Courtney Duchardt[1], Clay Burtrum[2]

Oklahoma State University[1], Burtrum Cattle LLC[2]

Introduction

Virtual fencing (VF) is a developing technology that allows ranchers to use GPS to create fences without physical barriers. It is mainly utilized in two ways: to protect at-risk ecological areas and to have more precise grazing management. The animals in this investigation, cattle (*Bos taurus*), are equipped with VF collars. The VF collars administer **audio cues** when cattle approach the barrier and then **electrical cues** if audio cues are ignored. Others have found that it takes 2-3 weeks or 10 approaches (Campbell 2017, Lee 2009) for cows to learn virtual fence perimeters.

Objectives and Hypothesis

Objective:
- Evaluate beef cattle responses to audio and electrical stimuli from virtual fence collars during a training and rotational period.

Hypothesis:
- Electrical cues will be greater initially but will decrease over time as cattle respond to the cues

Figure 1: Cow with VF collar

Methods

- Cows (85) were equipped with VF collars
- Data was collected over 9 days from 1/24/23 - 2/1/23

Training Phase 1: Virtual fence followed the outline of the physical fence for two days.
Training Phase 2: Virtual fence was moved off the physical fence five meters into the pasture for two days.
Rotational Phase: Cross fence was implemented for 11 days.

Results

Total number of electrical cues (Fig 2) and percent of electrical cues (Fig 3) received by 85 cows during a four-day training (pink) and eleven-day rotational (gold) period.
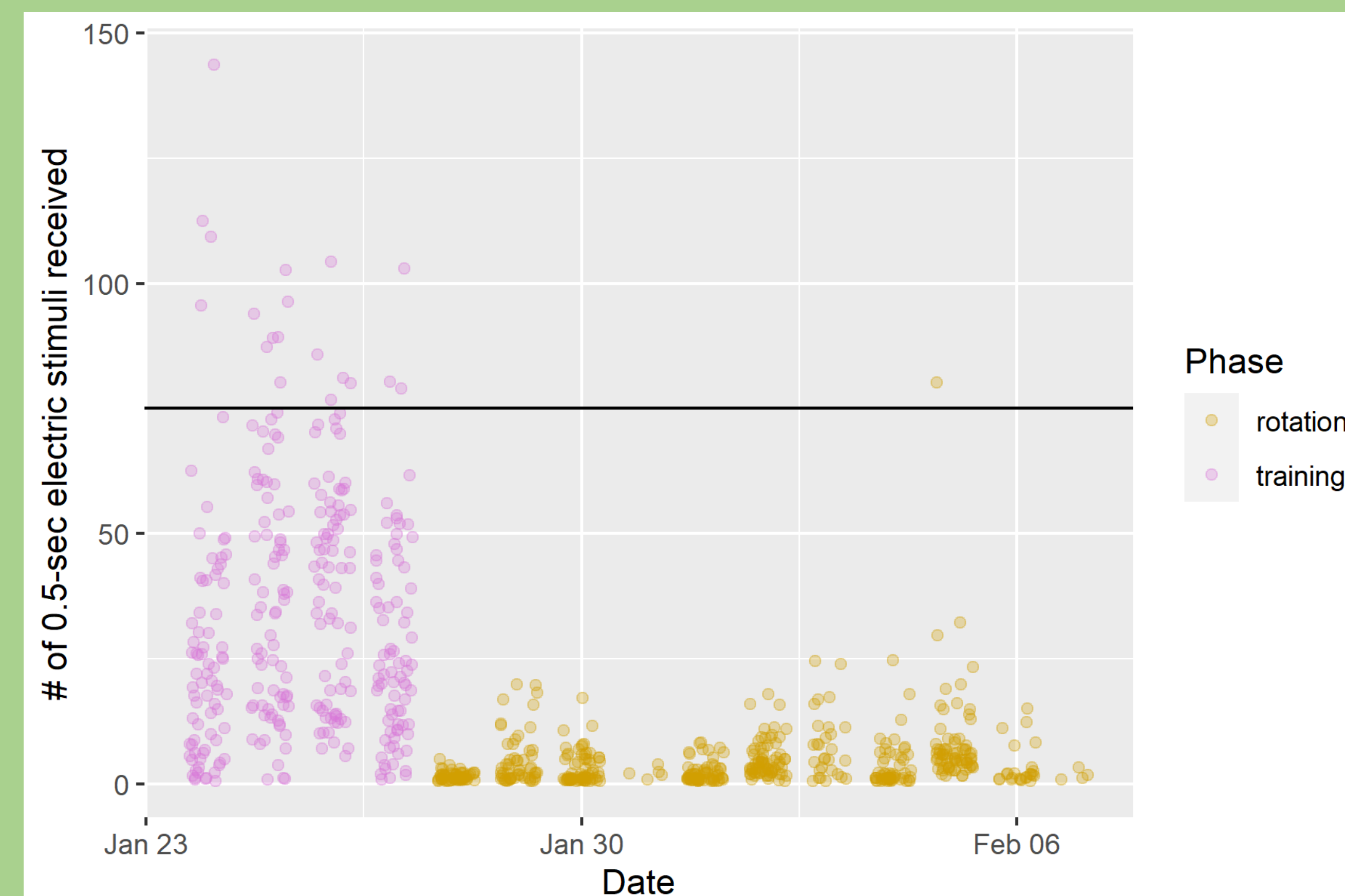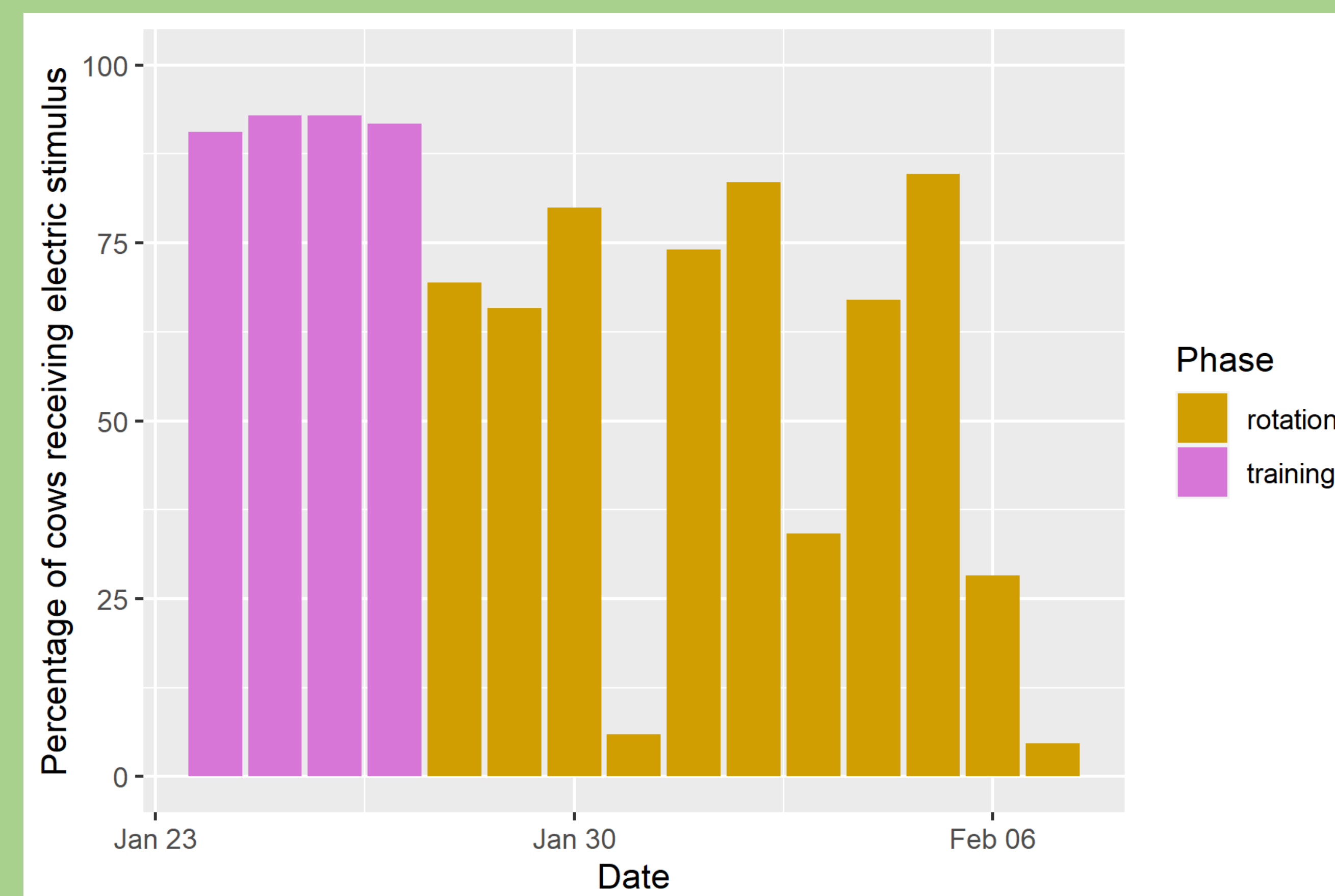

Figure 2

Figure 3

Audio and electrical cues:
- Audio expected to remain constant
- Electrical cues slightly increased days 1-4
- Electrical cues decreased days 5-15 compared to training days
- Electrical cues fluctuated in rotational period
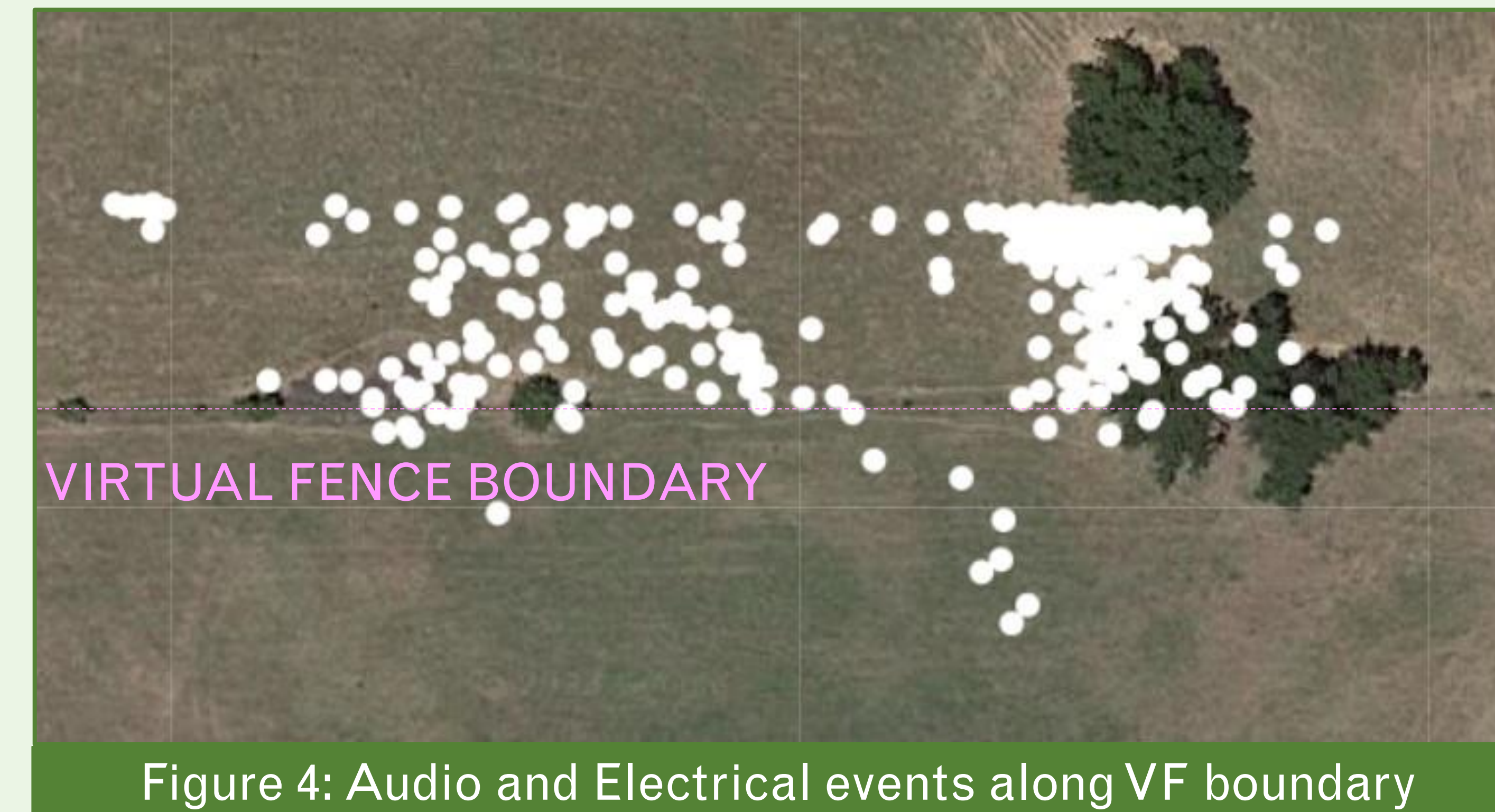

VIRTUAL FENCE BOUNDARY
Figure 4: Audio and Electrical events along VF boundary

Implications

Cattle responded to electrical cues more quickly than previously identified. A four-day training period is enough to train cattle to respond to an immobile virtual fence boundary.
Because of the developing technology, audio cues could not be calculated the same way electrical cues are. Future studies should find new ways to evaluate audio cues and compare them to electrical cues to better understand cattle responses

Acknowledgments

Works Cited

Campbell, D., Lea, J., Farrer, W., Haynes, S., & Lee, C. (2017). Tech-savvy beef cattle? how heifers respond to moving virtual fence lines. *Animals*, 7(12), 72. https://doi.org/10.3390/ani7090072

Lee, C., Henshall, J. M., Wark, T. J., Crossman, C. C., Reed, M. T., Brewer, H. G., O'Grady, J., & Fisher, A. D. (2009). Associative learning by cattle to enable effective and ethical virtual fences. *Applied Animal Behaviour Science*, 119(1-2), 15–22. https://doi.org/10.1016/j.applanim.2009.03.010