Embryonic Hypoxia Alters Exploratory Movement in Adult Geckos

Nikki Boon[1],

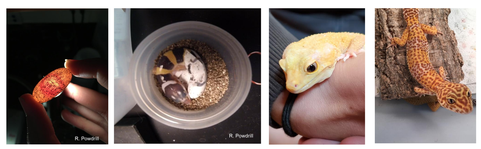
Kyleigh Adorno[1], Kayley Ozimac[1], Emma Kinerson[2],Scott L. Parker[2], & Ryan M. Yoder[1]

[1]Psychology & [2]Biology · Coastal Carolina University · Conway, South Carolina

Introduction

- Exploratory movements are not random, but are organized around a reference point for many species.[1-4]
- Hypoxic conditions negatively affect brain development in most species.
- Brief (10 day) periods of hypoxia *in ovo* are sufficient to cause brain damage in developing leopard geckos (*Eublepharis macularius*).
- We evaluated the organization and kinematic properties of non-visual exploratory movements in adult leopard geckos that developed in normoxic conditions *in ovo* and those that developed in temporary (10 days) hypoxic conditions *in ovo*.

Methods



Animals: Leopard gecko eggs were placed in normoxic conditions (n = 14) throughout the incubation period or with 10 days of hypoxic conditions (n = 3). Animals were >1 year of age at time of testing.

Apparatus: 91 cm diam. white wooden table within a black-walled room. An overhead infrared-capable video camera monitored movements.

Procedure: Geckos were individually placed on the table and allowed to explore for 60 min. in complete darkness.

Analysis: Videos of each trial were then analyzed offline and the animal's position coordinates were calculated at 5 frames/sec (Ethovision). Each trial was separated into sequential 10-min segments, and movement properties were evaluated across five segments.

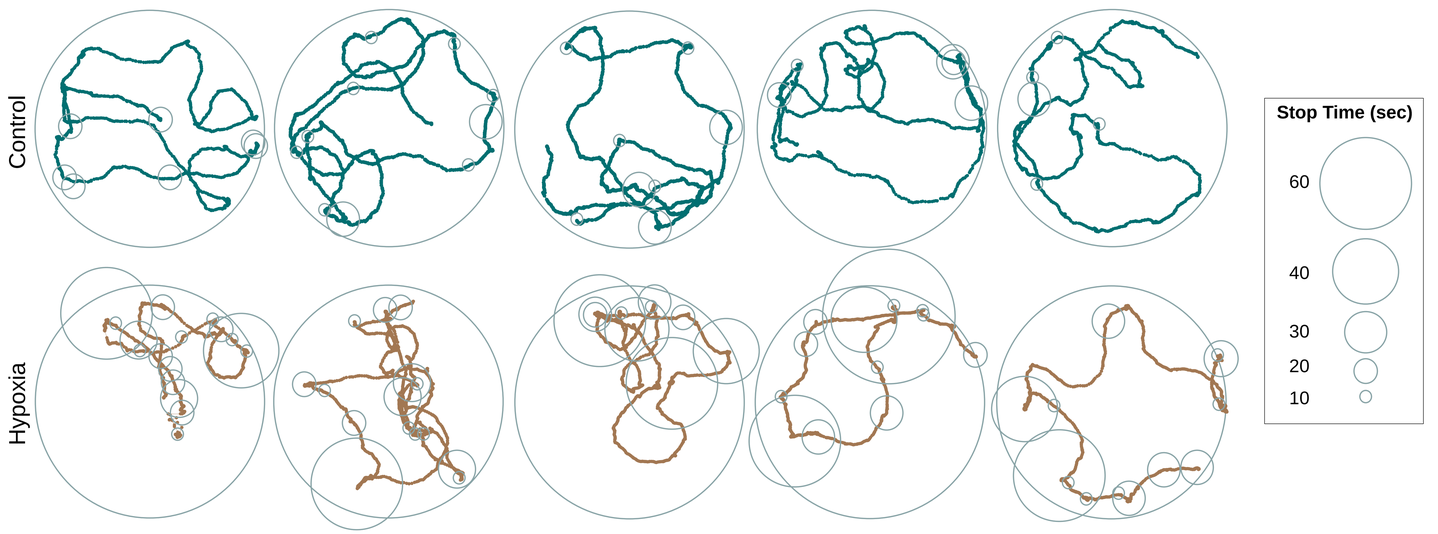
Project in Brief

Design: We evaluated the effects of *in ovo* hypoxia on the organization and kinematic properties of non-visual exploratory movements in adult leopard geckos.

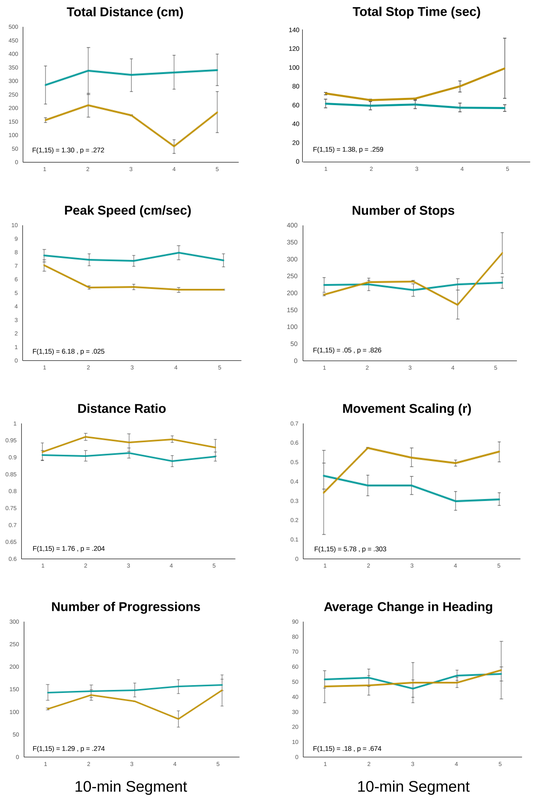
Results: Geckos readily explore a novel environment but do not organize their movements around a reference point. Geckos that experienced early hypoxia showed significantly lower peak speeds and greater movement scaling, relative to controls. The hypoxia group showed no significant differences in movement kinematics.

Conclusion: These results suggest the brain damage caused by early hypoxia causes the geckos to move more slowly, but to still retain the ability to move normally and to accurately estimate distance.

Future Directions: On-going studies in our lab evaluate the regional brain damage in adult geckos following early hypoxia.



Results



References

1. Blankenship, P. A., Cherep, L. A., Donaldson, T. N., Brockman, S. N., Trainer, A. D., Yoder, R. M., & Wallace, D. G. (2017). Otolith dysfunction alters exploratory movements in mice. *Behavioural Brain Research*, *325*, 1-11. doi:10.1016/j.bbr.2017.02.031.
2. Donaldson, T. N., Jennings, K. T., Cherep, L. A., Blankenship, P. A., Yoder, R. M., Blackwell, A. A., Wallace, D. G. (2019). Progression and stop organization reveals conservation of movement organization during dark exploration across rats and mice. *Behavioural Processes*, *162*, 29-38. doi:10.1016/j.beproc.2019.01.003.
3. Yoder, R. M. & Kirby, S. L. (2014). Otoconia-deficient mice show selective spatial deficits. *Hippocampus, 24*(10), 1169-1177. doi:10.1002/hipo.22300.
4. Yoder, R. M., Goebel, E. A., Köppen, J. R., Blankenship, P. A., Blackwell, A. A., & Wallace, D. G. (2015). Otolithic information is required for homing in the mouse. *Hippocampus,* 1-10. doi:10.1002/hipo.22410