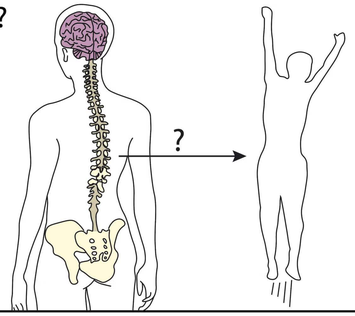
Quantitative Behavioral Analysis of Jumping in Mice

Isabelle Hua[1], Fabricio Nicola[1], Krystal Santiago-Colon[1], Ariel Levine[1]
[1]National Institute for Neurological Disorders and Stroke

National Institute of Neurological Disorders and Stroke

Introduction

Central Q: How does the spinal cord encode movements?

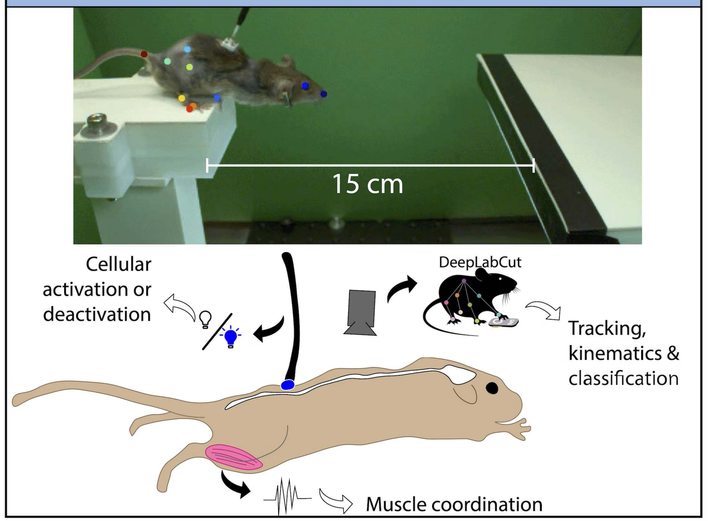


Goals

Obtain a quantitative characterization of mouse behavior using limb movements and muscle activity

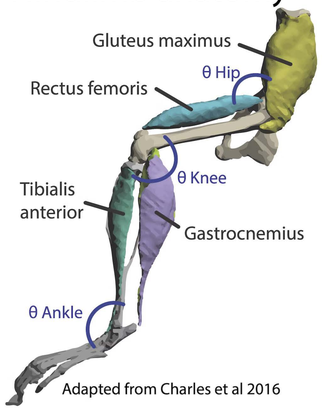
Understand the role of specific cell types through perturbations such as optogenetics

Methods



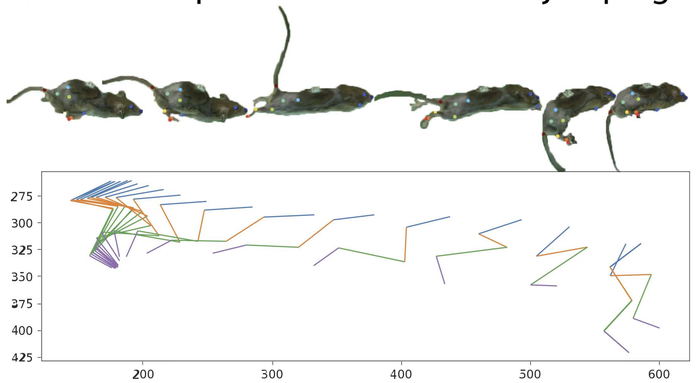
Results

Hindlimb anatomy

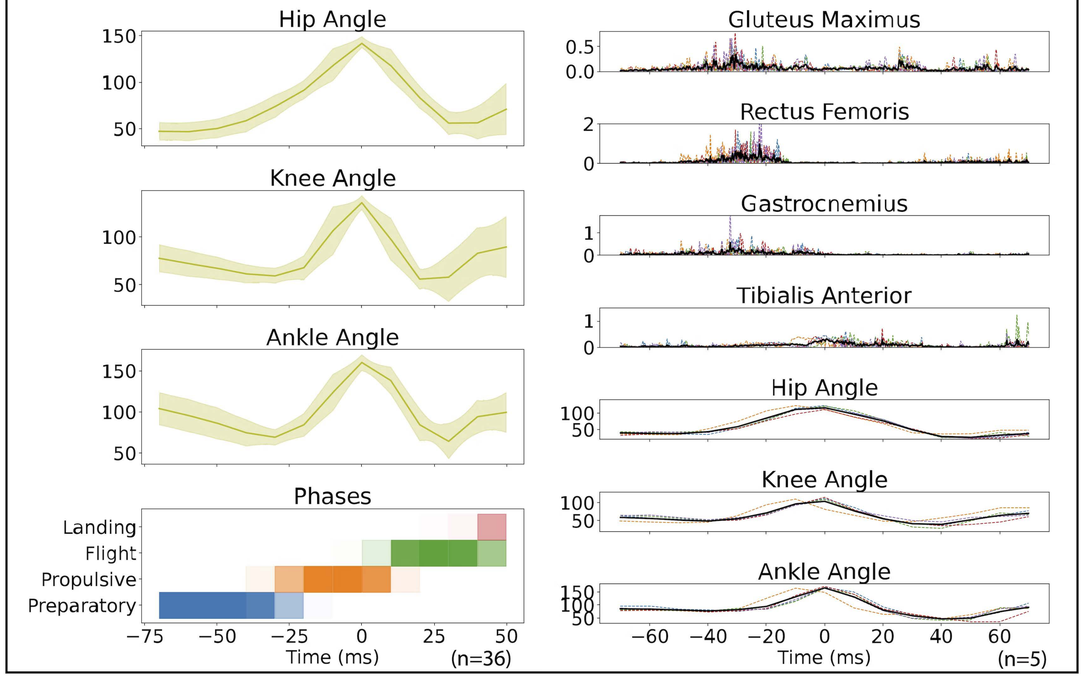


Adapted from Charles et al 2016

Markerless pose estimation of free jumping

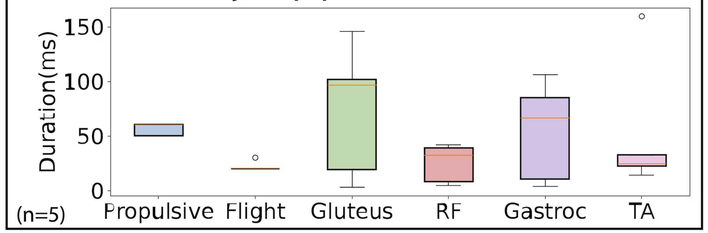


Concurrent kinematic analysis and muscle recording



Results

Duration of jump phases and EMG burst



Conclusions

- Maximal extension of hindlimb joints occurs during propulsive phase
- Robust and reliable activation of hindlimb extensor muscles during extension
- Extensors are active for a greater duration on average than flexors
- TA is activated in the later phases of jumping

Future Directions

Improve baseline characterization of jumps

Use optogenetics to perturb specific spinal populations during behavior and quantify functional effects on movement

References

Charles JP, Cappellari O, Spence AJ, Hutchinson JR, Wells DJ (2016) Musculoskeletal Geometry, Muscle Architecture and Functional Specialisations of the Mouse Hindlimb. PLOS ONE 11(4): e0147669. https://doi.org/10.1371/journal.pone.0147669

Funding & Disclosures

This work was supported by NIH Intramural funds through 1ZIA NS003153. The authors have no conflicts of interests to declare.