

Does metabolic cost explain preferred reaching speed?

Integrative Physiology
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Neuromechanics Lab

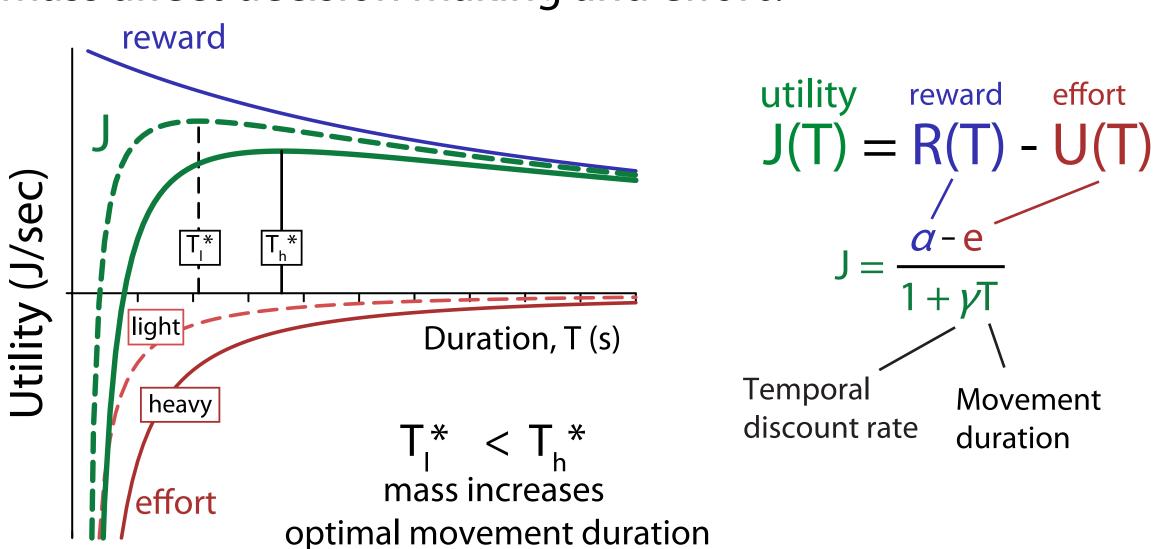
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1. Objectives

It has been suggested that decision making and movement control share a common utility¹. How does mass affect decision making and effort?

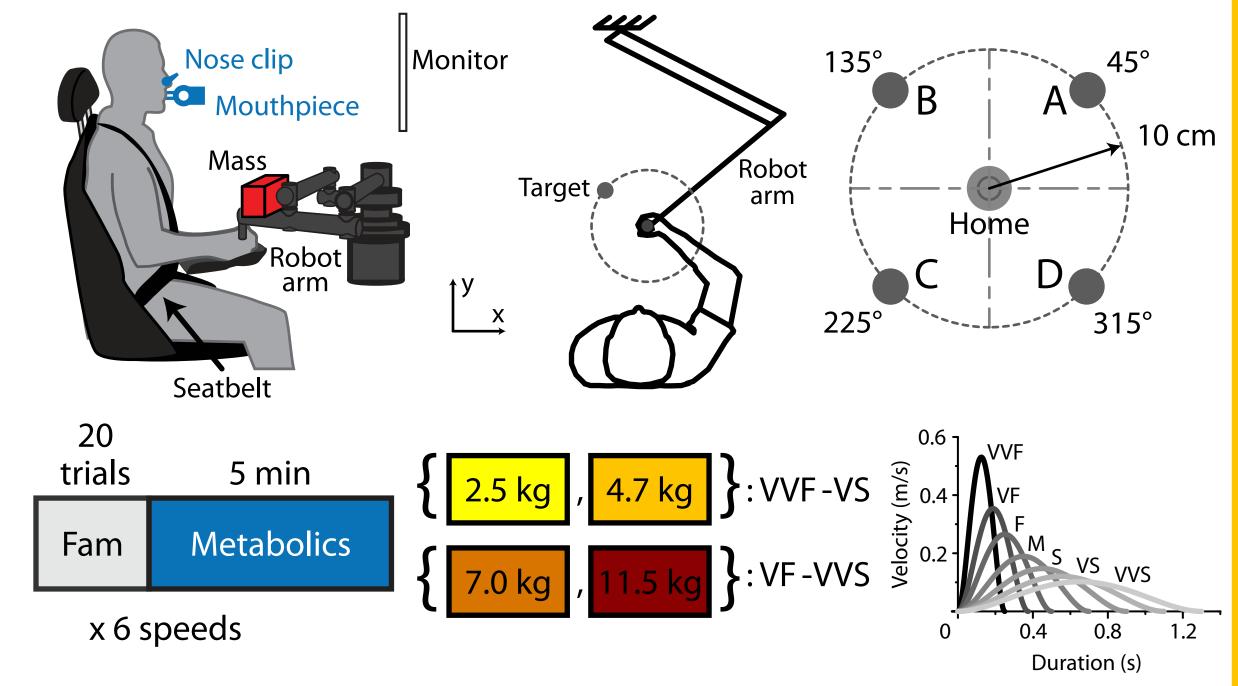


Hypothesis: Metabolic cost alone cannot predict mass based changes in preferred reaching duration or absolute movement duration.

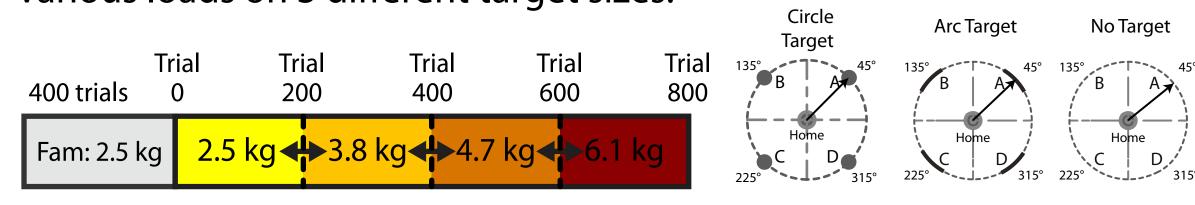
- Q1: How does mass affect metabolic cost?
- Q2: How does mass affect preferred movement duration?
- Q3: Can metabolic cost or this utility model explain preferred movement duration?

2. Measuring the Metabolics of Reaching and Preferred Reaching Speed

Metabolics: Subjects (N=8) performed 10 cm reaching movements with various loads across a range of speeds.



Preferred: Subjects (N=12) performed reaching movements with various loads on 3 different target sizes.

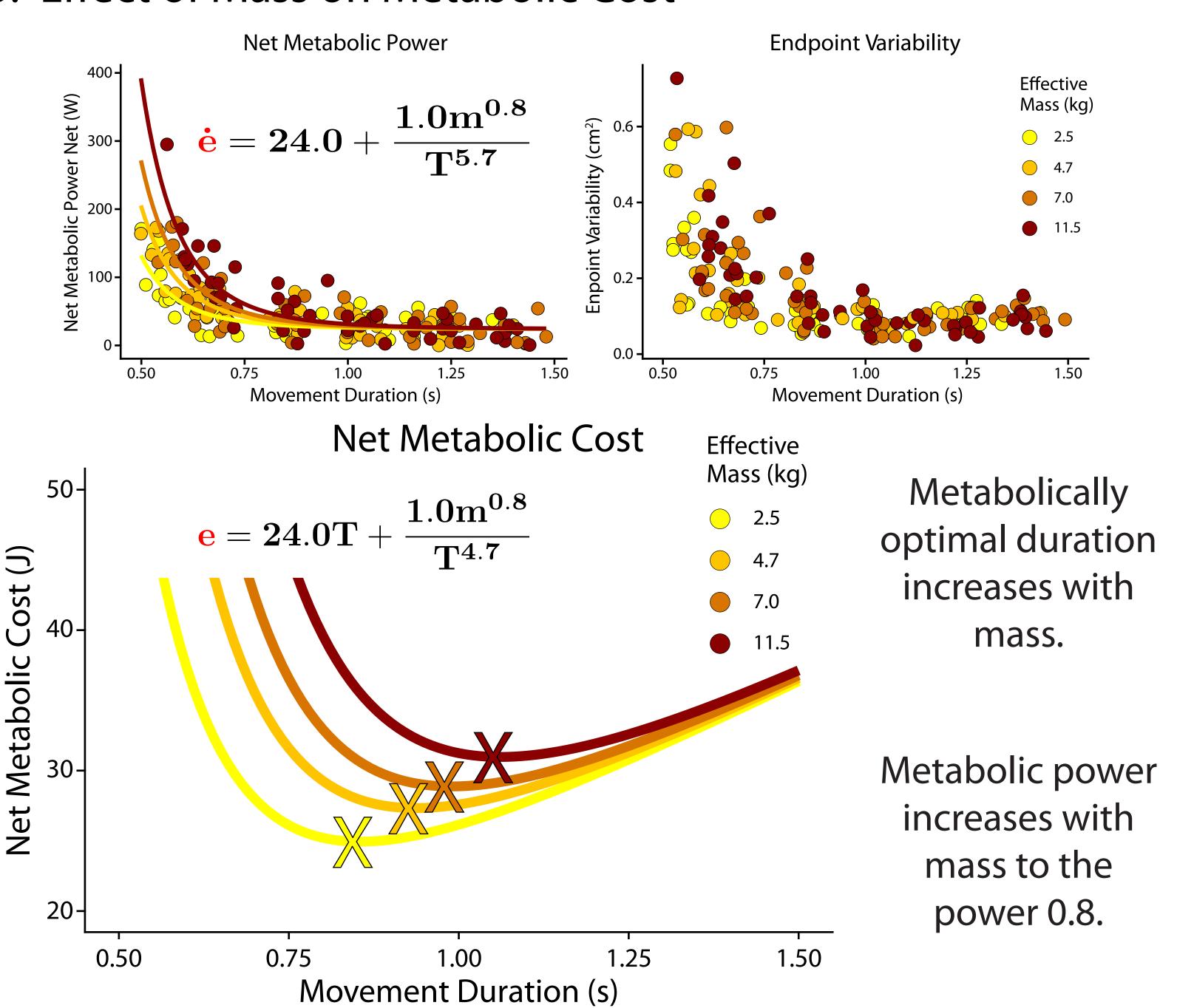


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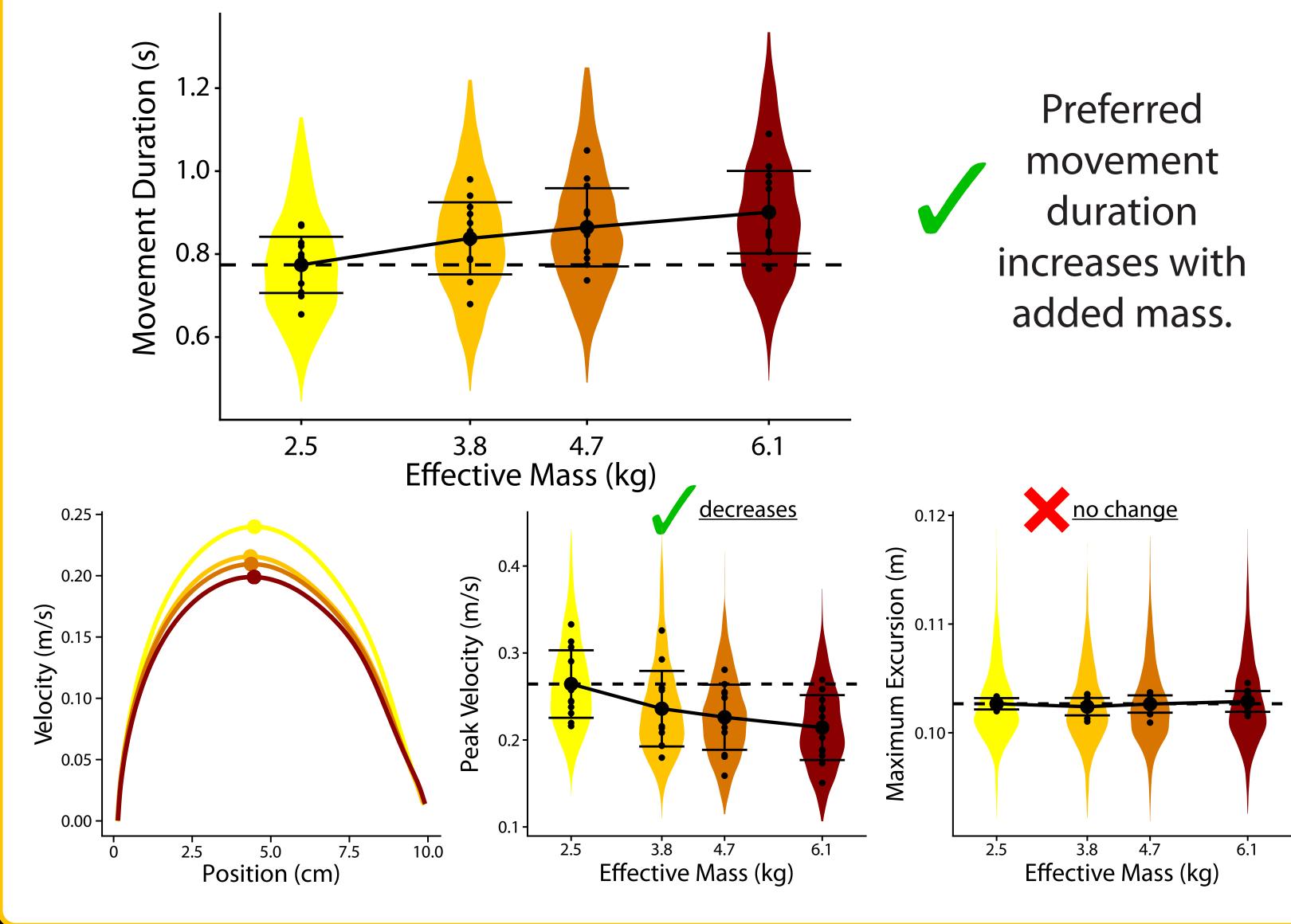
References

1. Shadmehr, Huang and Ahmed (2016). Current Biology.
2. Li and Todorov (2007). Int J Control..

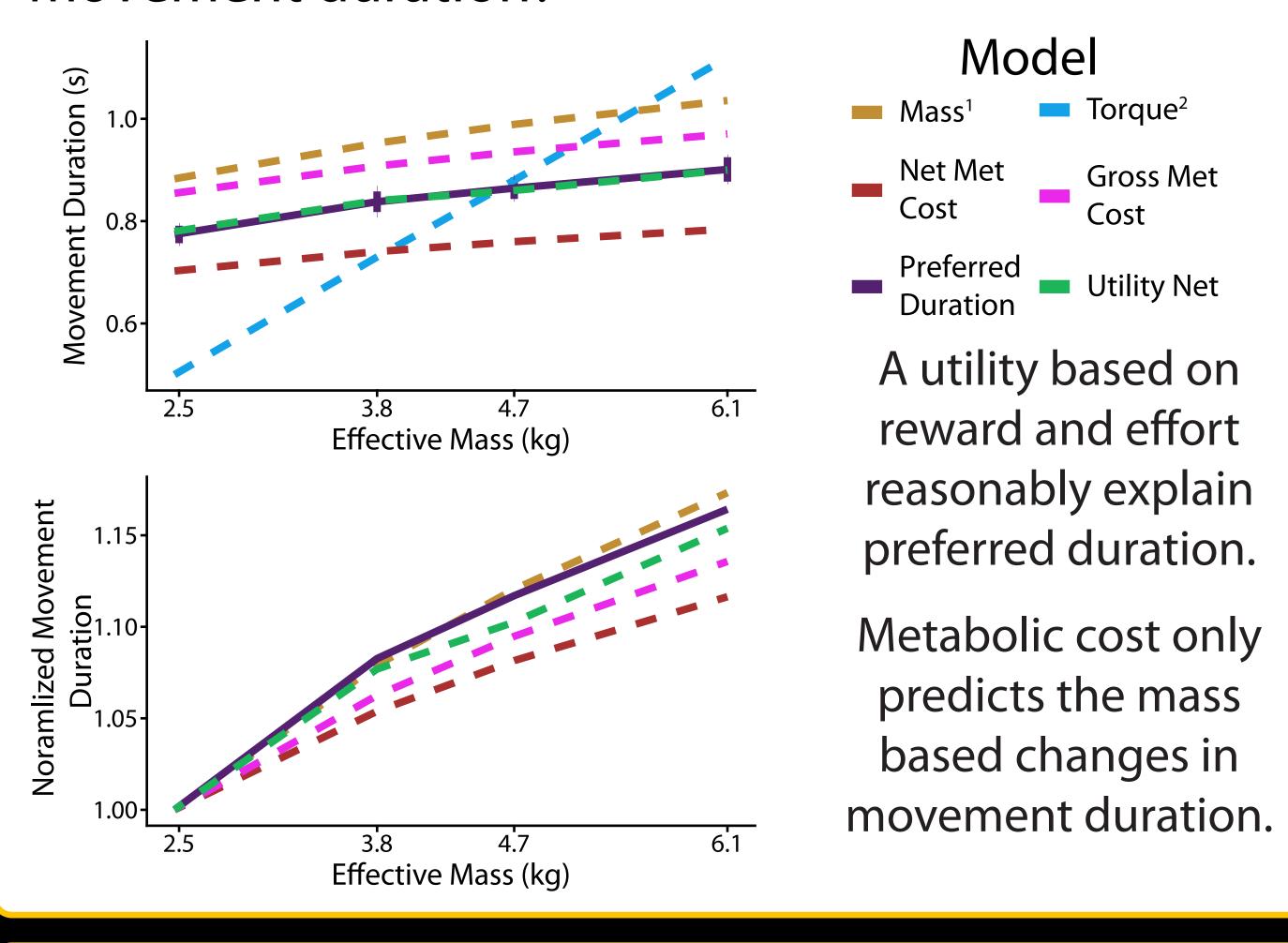
3. Effect of Mass on Metabolic Cost



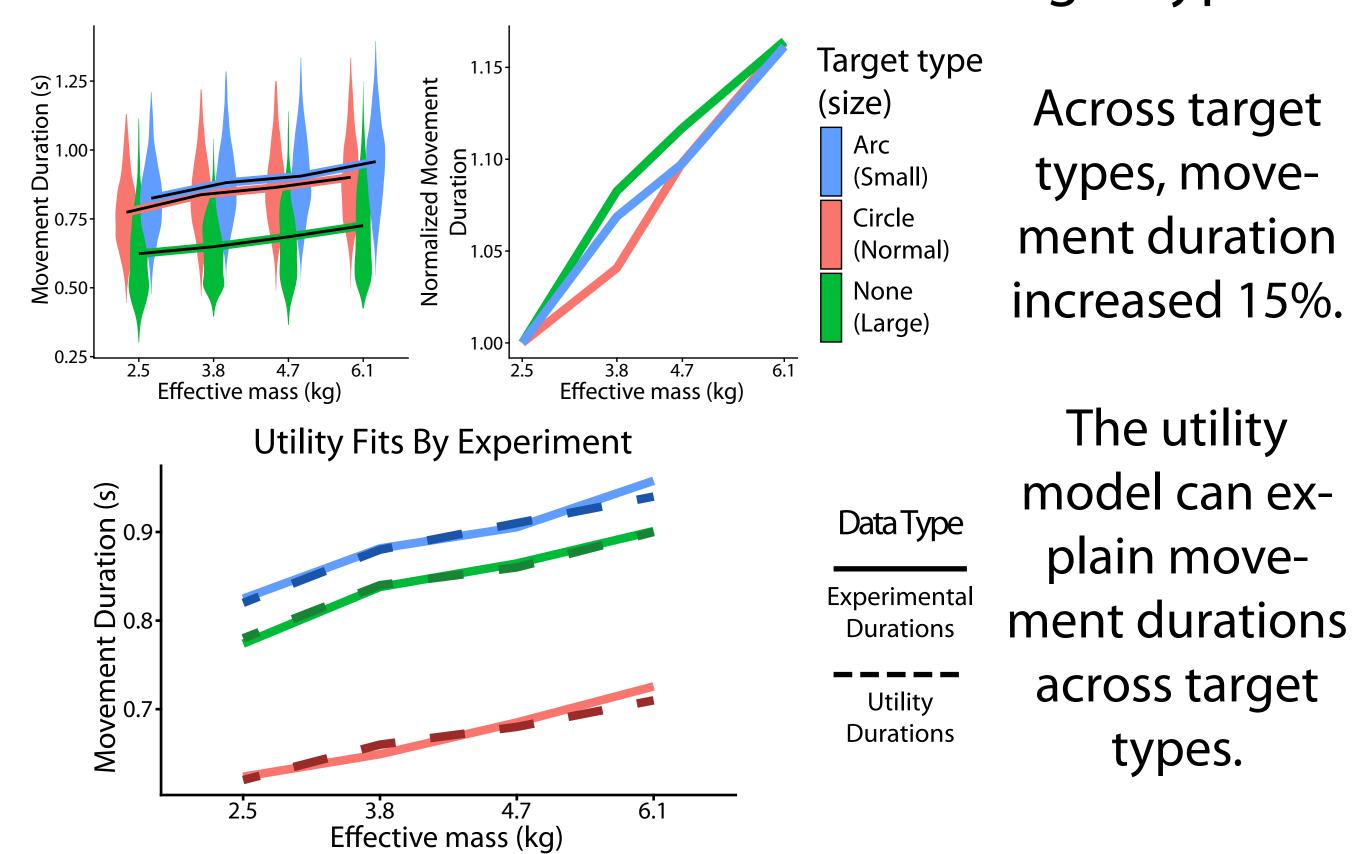
4. Effect of Mass on Preferred Movement Kinematics



5. Does metabolic cost explain preferred movement duration?



6. Effect of Mass is conserved across target types



7. Conclusions

We examined how increases in effort via mass (added at the hand) affects metabolic cost and preferred reaching speed. We find that:

- 1) Metabolic cost increases with mass to the power 0.8.
- 2) Mass increases preferred reaching duration (reduces speed).
- 3) Metabolic cost alone reasonably explains mass based <u>changes</u> in movement duration, but <u>not absolute duration</u>.
- 4) A utility model that represents effort as metabolic cost can <u>accurately</u> predict preferred reaching duration.