



Effect of mass on cost of effort in reaching

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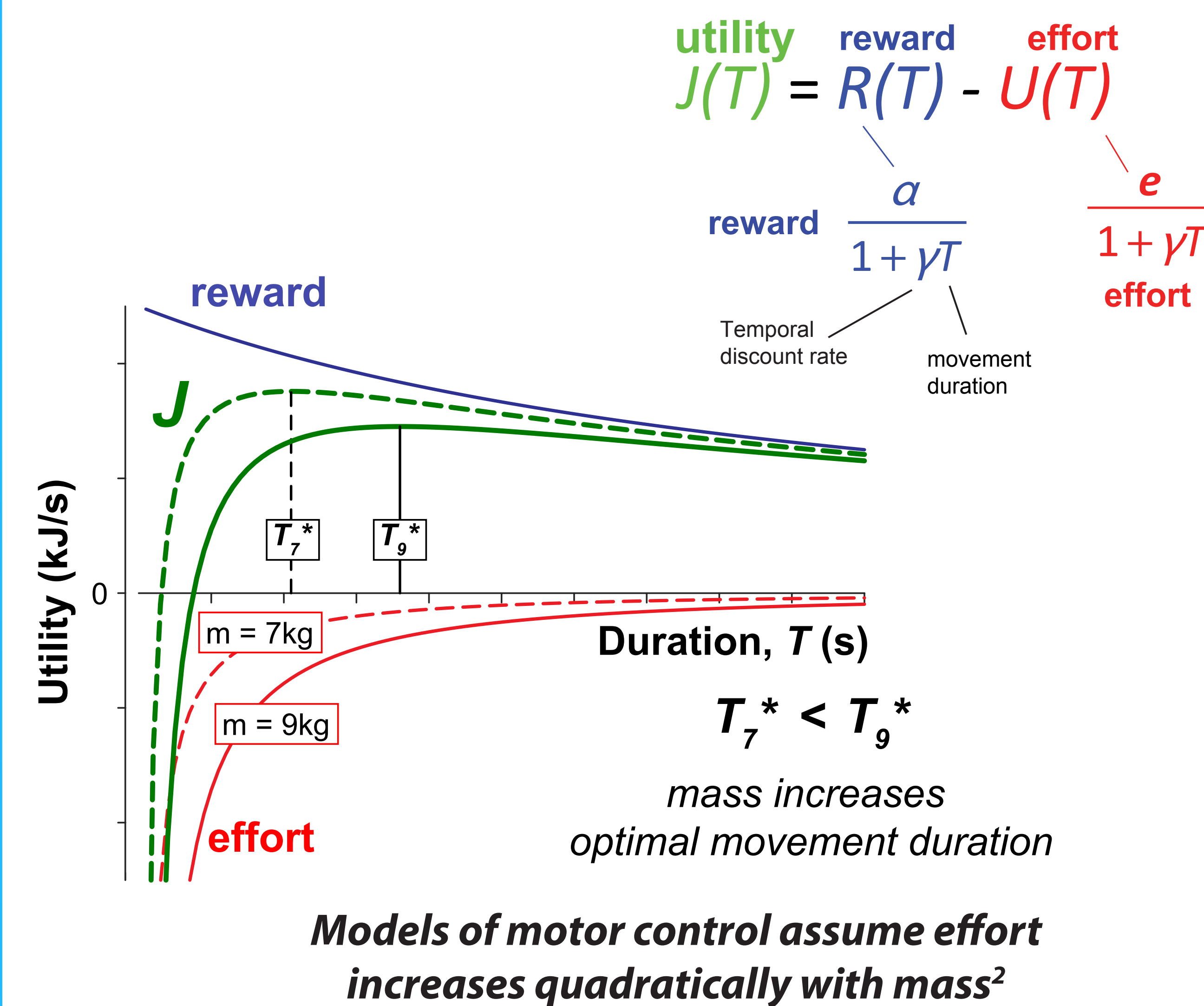
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1. Objectives

It has been suggested that decision making and movement control may share a common utility¹.

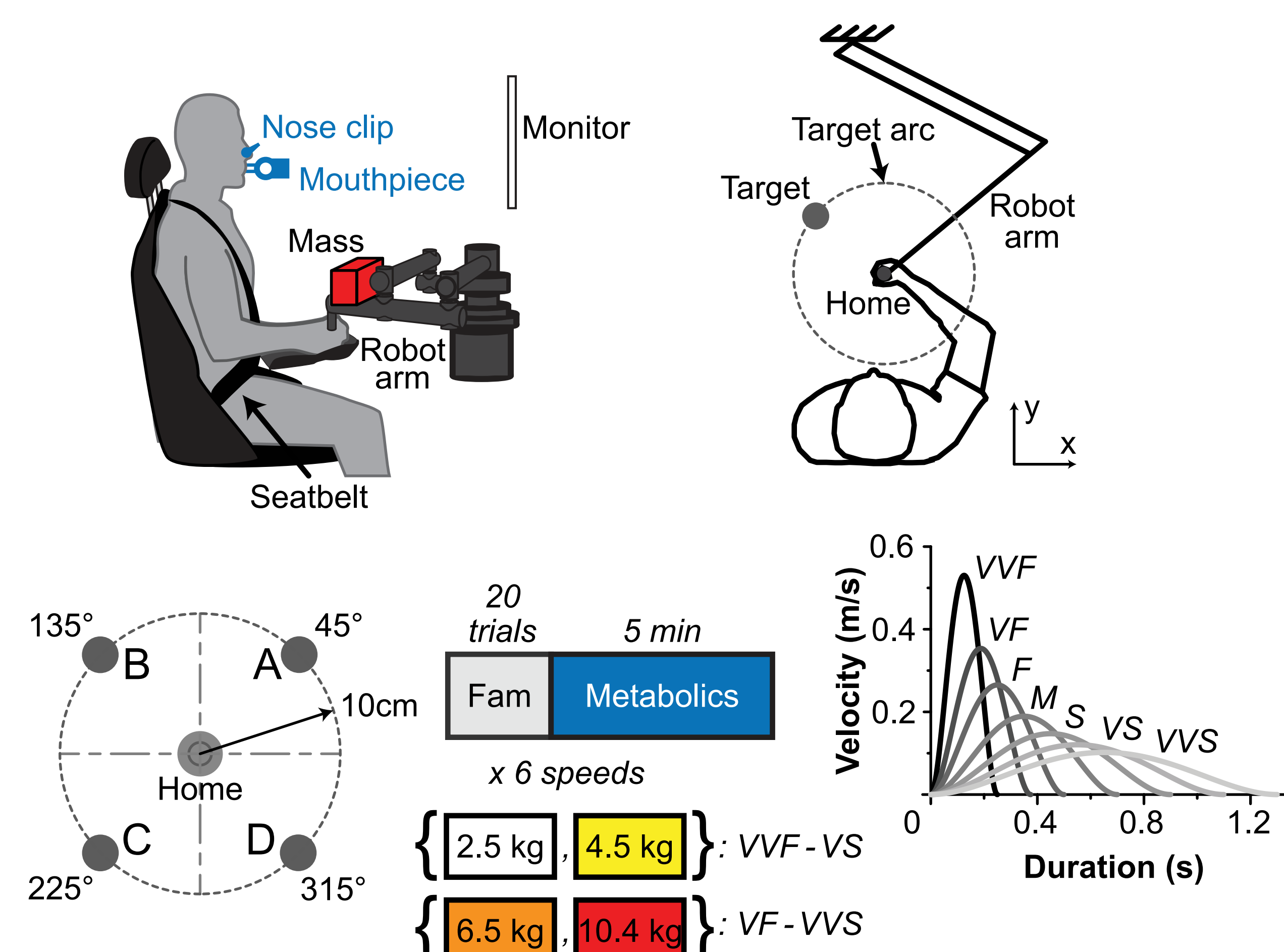


Q1: How does mass affect metabolic cost?

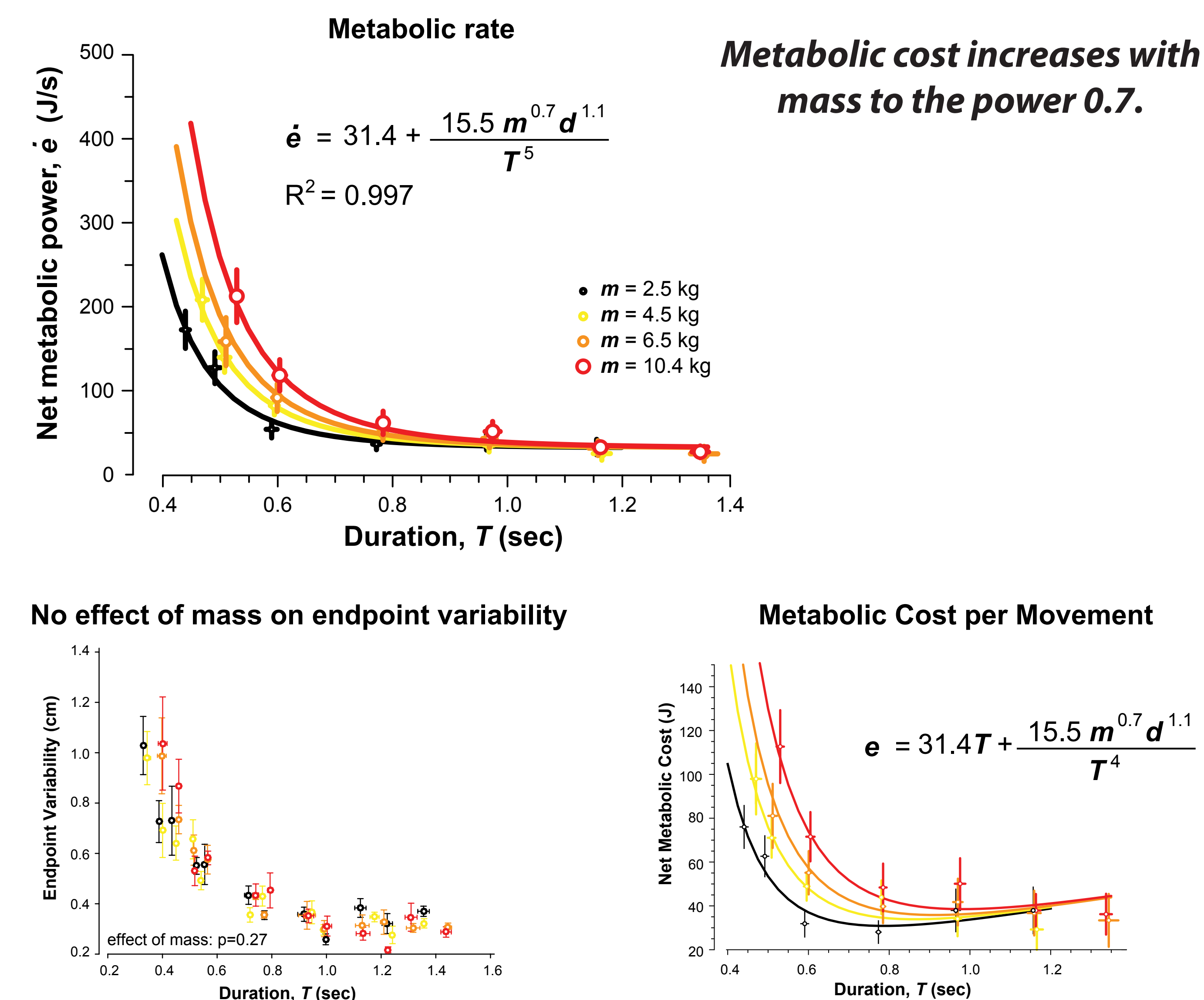
Q2: Can metabolic cost explain mass-related changes in vigor?

2. Measuring the Metabolics of Reaching

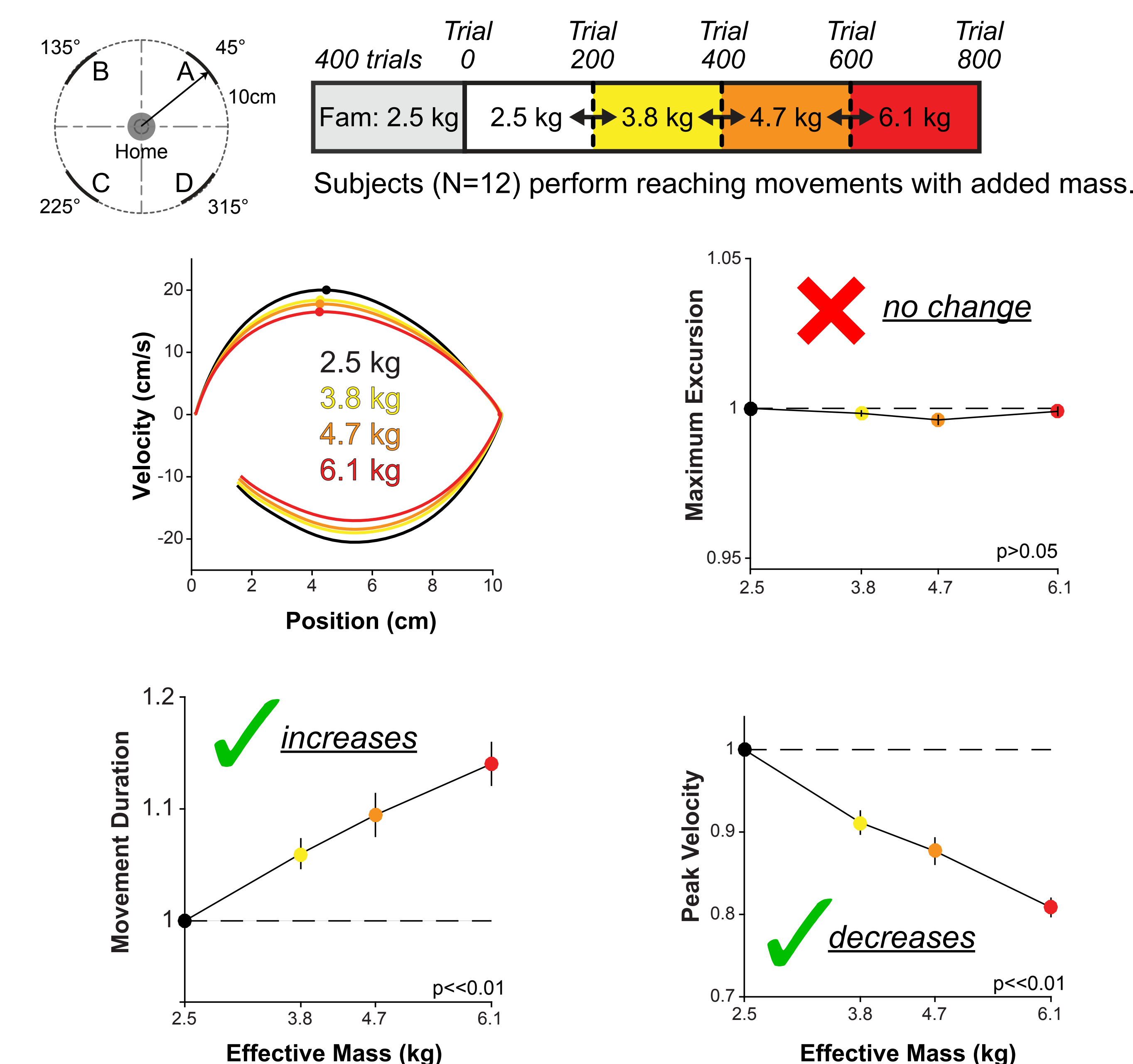
Subjects (N=8) perform reaching movements with added mass.



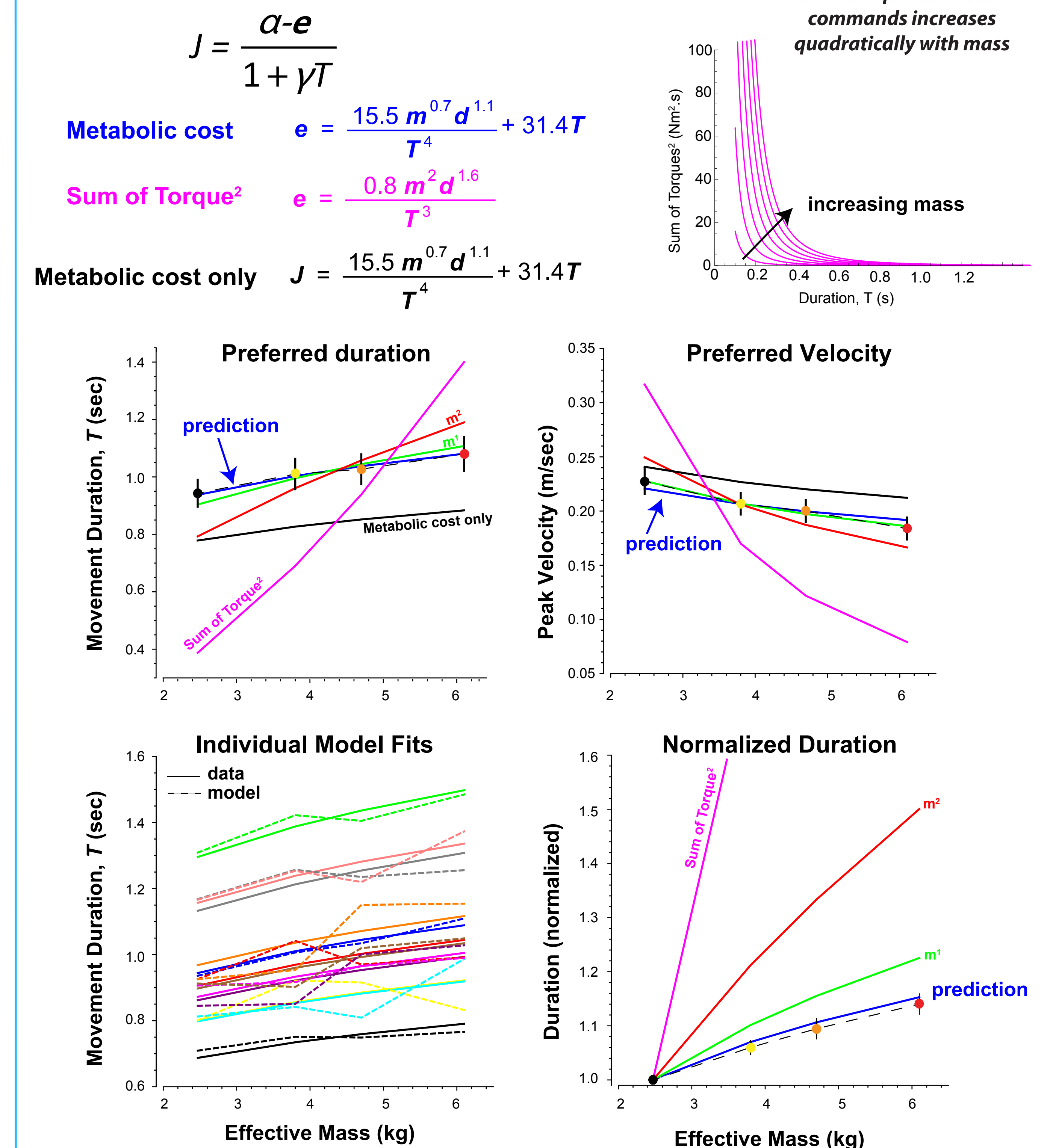
3. Effect of Mass on Metabolic Cost



4. Effect of Mass on Preferred Duration



5. Testing the model



A representation of effort as metabolic cost, discounted by time reasonably explains the effect of mass on preferred speed.

Effort that increases quadratically with mass is inconsistent with the data.

A utility based on metabolic cost alone is inconsistent with the data.

6. Conclusions

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

- 1) **Metabolic cost** increases with **mass** to the power 0.7.
- 2) **Mass** reduces preferred reaching speed (increases duration).
- 3) A **utility** model in which **effort** is represented as **metabolic cost** and both **reward** and **effort** are temporally discounted can explain the effect of mass on preferred reach speed.

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References

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