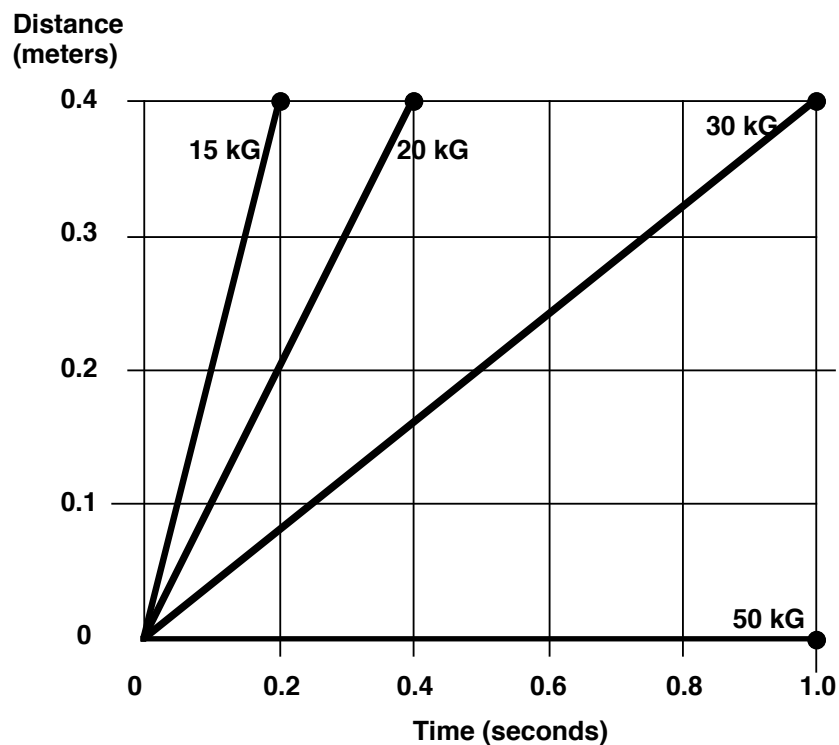


Basic Physics of Muscle Contraction

☹ Note: although I cribbed these from my Exercise Physiology class for non-majors, they are worth doing so that you are familiar with distance, velocity, force and power diagrams for skeletal muscles. 😊

Imagine that someone is pressing (lifting from shoulder/chest to above head) a series of different weights. You record the time required to move the different weights -- notice that in each case the weight is moved the same distance (why?). You summarize your results as a graph (please note that we ignore the acceleration of the weight when the person first starts the press and when they finish the press).



Answer the following questions:

1. What does the distance 0 refer to (where is the weight being held)?
2. Where is the 0.4 meter distance measured from -- it is 0.4 m from what (the floor? Mars?, the lifters shoulders?)
3. How far did the person move the 50 kG mass?
4. In these graphs, the individual weights are depicted as having a constant velocity during the press. What is the meaning (term for) the slope of each plot?
5. Based on your own experience of lifting any heavy weight, sketch what you think is a more accurate depiction of the distance vs. time than the one shown above. Note that you only need to make a graph for one weight and you do not need actual times and distances -- thus I am asking for a **qualitative** graph as compared to the **quantitative** graph shown above.
6. Make a plot of velocity (m/s) vs. mass lifted (kg).

7. Find the work (joules) done in each lift (we are only interested in difference in energy between the resting point and the top of the lift).
8. Find the power in watts exerted by lifter with each weight. Make a graph of power vs. mass lifted.
9. Which contractions have at least some isometric component?