

INVESTIGATING 2D MODELS OF THE FINGER

You and your team have a set of 2D model finger bones. NOTE: Not all of these bones are actually part of a human finger—you may have some extra parts! With your team, assemble a finger out of your model pieces.

Q1: Sketch/trace your initial model in your notebook. Label the “Distal”, “Middle” and “Proximal” Phalanx bones.

In your set, there are several options for your 3rd metacarpal: one is **symmetrical** and two are **eccentric** (not symmetrical). Try rotating the proximal phalanx around the joints of each of the 3rd metacarpal bone types.

Q2: What differences in motion do you notice when you use the eccentric 3rd metacarpal compared to the symmetric 3rd metacarpal? What causes these differences in motion?

Q3: Which type of bone (symmetric vs. eccentric) do you think would provide more control over finger motion?

Q4: Which type of bone (symmetric vs. eccentric) do you think ACTUALLY exists in your finger? What evidence do you have to support this?

Based on your answers to questions 2-4, check your initial model of the finger that you drew for Q1. If needed, change your 2D model to make it more accurate.

Q5: If your model changed from Q1, sketch/trace your new model.

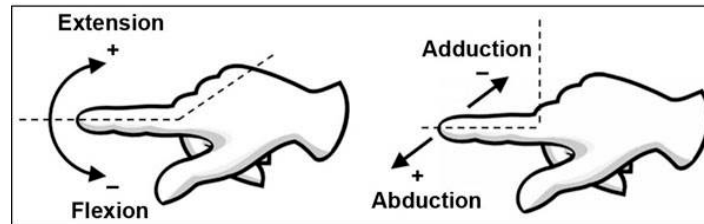
With your team, trace your model of a finger onto a piece of foam. Cut out this model. Staple the proximal phalanx to a folder. Your goal is to develop a finger that can both flex and extend (Flexion, Extension). Use materials provided by your teacher to complete each of the following tasks. Revise as needed.

- a) Connect the middle phalanx to the proximal phalanx in a way that the middle phalanx can rotate around the joint of the proximal phalanx.
- b) Connect the distal phalanx to the middle phalanx. Be sure the distal phalanx can rotate around the joint of the middle phalanx.
- c) Add “pulleys” to your phalanx bones to hold/attach tendons to your bones to allow for flexion movement of the finger.
- d) Add “pulleys” to your phalanx bones to hold/attach tendons to your bones to allow for extension of your finger.
- e) Add tendons to your finger to allow for flexion movement of the finger.
- f) Add tendons to your finger to allow for extension movement of the finger.

Q6: Briefly describe your design process. What worked? What did not work? What revisions did you have to make along the way? Why?

Q7: Was your model successful? In what ways would you improve your model?

The joint at the base of your proximal phalanx is different from the hinge joints found between your other phalanx bones.



Q8: *Based on the diagram above, how is the joint at your proximal phalanx different? What types of motion does it allow?*

Q9: *Knowing that tendons/muscles can ONLY apply pulling forces, where on your phalanx would you need to attach muscles in order to cause "abduction" (when your pointer finger is "abducted" and pulled away from your middle finger)? Explain your reasoning.*

Q10: *Where on your phalanx would you need to attach muscles in order to cause "adduction" (when your pointer finger is pulled toward and "added to" your middle finger)? Explain your reasoning.*

"people acting together as a group can accomplish things which no individual acting alone could ever hope to bring about,"

-Franklin Delano Roosevelt (FDR)