Clay hand Lesson – CP Physics Prosthetic Hand PBL

Discussion (kinesthetic with student trying movements and identifying parts of the hand)

* What are the possible directions of movement? –
  + use shoulder movement as an example -Not using the technical terms of degrees of freedom – can move about an axis 1) left/right, 2) up/down, 3)rotate
  + discuss possible movement of fingers and wrist joints-the wrists inability to rotate about an axis surprises them
* define general vocab terms to use in discussion (students take notes on organizer/diagram)
* discuss/define four components(bones, ligaments, tendons, musles)
  + label the bones of the hand
  + make a point of recognizing the metacarpals are in the palm of the hand and not the “fingers”

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| **General Vocab** | | | | |
| Ventral (palmar) | | | Draw a dolphin/whale and ventral side of hand (not actually defined – more discusses) - anterior, “front” (more often called “palmar” – instead of ventral in anatomy of the hand) | |
| Dorsal | | | Draw/demonstrate - posterior, “back” | |
| Proximal | | | “close” (in relation to the wrist in the case of the hand) | |
| Intermediate | | | middle | |
| Distal | | | “distant” (in relation to the wrist in the case of the hand) | |
| Flexion | | | A movement toward ventral | |
| Extension | | | A movement toward dorsal | |
| Abduct | | | To draw away from median of the body | |
| Adduct | | | To draw inward toward the median axis of the body | |
| **Four main components** focusing on (not touching on nerves or blood vessels/veins) | | | | | |
| **Bones** (the structure) | | | | Rigid (in simplification for our purpose) | |
| Forearm | Ulna | | | One of two long bones of the forearm – closest to the body when the arms are down at the sides and palms facing forward | |
| Radius | | | One of two long bones of the forearm –farthest from the body when the arms are down at the sides and palms facing forward | |
| Hand | Carpal | | | 8 bones of the wrist (connected with the radius and ulna of the forearm) | |
| Metacarpal | | | 5 bones between the phalanges and the carpel bones – makes the knuckles | |
| Phalanges | proximal | | Closest to the metacarpal | |
| intermediate | | Middle phalanx | |
| distal | | Most distant phalanx (tips of fingers) | |
| **Ligament** (constraints of the rigid structure) | | | | Short band of tough, flexible, fibrous connective tissue that **connects two bones or cartilages or holds together a joint** | |
| Ex. 3 ligaments make up the interphalangeal joint (joints between the phalange bones that constrain them to 1 degree of freedom), | |
| **Tendon** (provides a path for force to be directed – tension, links the power source (muscle) to the rigid structure (bone)) | | | | Flexible (sometimes elastic) cord of strong fibrous collagen tissue **attaching a muscle to a bone** | |
| **Muscle** (“power house”- force generator) | | | | Band or bundle of fibrous tissue that has the ability to contract. | |

* Build Clay hand models (have them mark lines on muscle to distinguish between muscle and tendon).
  + - Label bones
    - Draw adduct muscles/tendons – green
    - Draw abduct muscles/tendons – blue
    - Draw flexion muscles/tendons – red
    - Draw extension muscles/tendons - orange / yellow