The Wrist and Finger Joints

• Remember, a joint is simply two bones which articulate. The wrist/hand region consists of 29 bones and multiple joints - which lends to high mobility.

• Our goal is to understand functional anatomy in order to apply knowledge to physical therapy, exercise prescription, for example. (so we’ll stick to gross movements of the wrist/hand)

Terminology

• Wrist:
  – as a joint, it is the articulation between the forearm and hand.
  – Sometimes, the wrist is discussed as a region, which would include the carpal bones.

• Hand
  – the bones distal to the wrist joint.
  – As a region, the wrist is part of the hand.
Bones

• 29 bones including:
  – (2 from the forearm, 27 from the hand)
  – distal aspect of the radius and ulna
  – 8 carpal (bulk of the hand)
  – 14 phalanges (the fingers)
  – 5 metacarpals
  – total: 2+8+14+5=29

Bones

• Radius and Ulna
  – the radius is more massive distally than the ulna
  – the ulna is more massive proximally than the radius
  – Remember, forearm pronation and supination are the result of the radius rotating about the ulna

Bones

• Carpal Bones
  – 8 total
  – 2 rows of 4
  – Proximal row: pisiform, triquetrum, lunate, scaphoid
  – Distal row: hamate, capitate, trapezoid, trapezium
Bones

- Metacarpals
  - 5
- Phalanges
  - 3 per finger
  - 2 per thumb

Joints

- Wrist Joint
  - Classified as a **Condyloid** Joint
    - allows for flexion, extension, radial and ulnar deviation
    - Remember, radius = thumb side
  - The motion of the wrist is due to the articulation of the radius and proximal carpal bones (or Radiocarpal joint).
  - There is an articular disk between the distal aspect of the ulna and triquetrum

- Proximal and distal interphalangeal joints
  - Fingers:
    - classified as ginglymus joints
    - allows for flexion and extension
  - Thumb:
    - consists of **three** joints, the first two are classified as ginglymus joints
      - metacarpophalangeal: g.j.
      - interphalangeal: g.j.
    - carpometacarpal: trapezium and metacarpal; saddle jt.
Movements of the wrist and hand

• **Wrist** (remember start from anatomical position)
  – Flexion
    • (or palmer flexion): anterior deviation from anatomical position.
  – Extension: dorsal flexion
  – Abduction
    • (or radial deviation or radial flexion)
  – Adduction
    • (or ulnar deviation or ulnar flexion)

Movements

• **Fingers**
  – Flexion: anteriorly directed movement
  – Extension
  – Abduction: movement of the fingers away from the midline of the hand.
  – Adduction
  – Thumb opposition: movement of the thumb to oppose any of the phalanges

Summary of bones and joints

• 29 bones make up the wrist and hand
  – radius, ulna, carpals, metacarpals, phalanges
• The wrist is primarily the articulation of the radius and proximal carpal bones
• There are many joints in the wrist/hand
  – fingers: metacarpal phalangeal, proximal & distal interphalangeal
  – thumb: carpometacarpal, metacarpal-ph., interphalangeal joints
Summary of movements

- Wrist:
  - flexion, extension, abduction, adduction
- Fingers
  - flexion, extension
- Thumb
  - Abduction, adduction, flexion, extension, opposition

Muscles of the Wrist and Fingers

- There are 15 critical muscles
  - 6 muscles are group as primary movers for wrist flexion and extension actions
  - 9 muscles are group as primary movers for hand (finger)
  - of the 15 muscles
    - 6 are primary movers for wrist ulnar deviation
    - 2 are primary movers for wrist radial deviation

Muscles causing wrist actions

- Wrist flexors
  - flexor carpi radialis
  - flexor carpi ulnaris
  - palmaris longus
- Wrist extensors
  - extensor carpi radialis longus
  - extensor carpi radialis brevis
  - extensor carpi ulnaris

These muscles do not cause finger movements
Muscles

• Finger flexors
  – flexor digitorum superficialis
  – flexor digitorum profundus
• Thumb flexor
  – flexor pollicis longus
• Finger extensors
  – extensor digitorum
  – extensor indicis
  – extensor digiti minimi
• Thumb extensor
  – extensor pollicis longus
  – extensor pollicis brevis

These muscles assist in wrist actions

Muscles

• Wrist radial flexors
  – flexor carpi radialis
  – extensor carpi radialis longus
  – extensor carpi radialis brevis
  – abductor pollicis longus
  – extensor pollicis longus
  – extensor pollicis brevis

Muscles

• Wrist ulnar flexors
  – flexor carpi ulnaris
  – extensor carpi ulnaris
• Wrist flexors
  – Origins generally on the anteromedial aspect of the proximal aspect of the forearm and medial epicondyle
  – Insertions: anterior aspect of the wrist and hand
• Wrist extensors
  – Origins: posterolateral aspect of the proximal forearm & lateral humeral epicondyle
  – Insertions: posterior aspect of wrist and hand

• Wrist abductors
  – Origin: anterior or posterior aspect of forearm
  – Insertion: radial side of hand
• Wrist adductors
  – Origin: ant or post aspect of forearm
  – Insertion: ulnar side of hand

Abductor pollicis longus (p155)

• Origin
  – posterior aspect of radius and ulnar midshaft
• Insertion
  – Base of 1st metacarpal (thumb)
• Action
  – thumb abduction
  – radial flexion
Extensor indicis (p156)

- Origin
  - middle to distal one-third of posterior ulna
- Insertion
  - base of middle and distal phalanxes
- Action
  - extension of index finger (1st)
  - weak wrist extensor

Extensor pollicis brevis (p157)

- Origin
  - posterior surface of lower middle radius
- Insertion
  - base of proximal phalanx of thumb
- Action
  - thumb extensor
  - weak wrist extensor

Extensor pollicis longus (p158)

- Origin
  - posterior lateral surface of middle aspect of ulna
- Insertion
  - Base of distal phalanx of thumb (dorsal surface)
- Action
  - wrist extension
  - thumb extension
Flexor digitorum profundus (p159)

- **Origin**
  - proximal three-fourths of the anterior and medial ulna
- **Insertion**
  - Base of the distal phalanxes
- **Action**
  - flexion of four fingers
  - wrist flexion

Flexor pollicis longus (p160)

- **Origin**
  - middle anterior surface of radius and anterior medial border of ulna
- **Insertion**
  - base of distal phalanx of thumb
- **Action**
  - thumb flexion
  - wrist flexion

Extensor carpi radialis brevis (p161)

- **Origin**
  - lateral epicondyle of humerus
- **Insertion**
  - Base of 3rd metacarpal (dorsal surface)
- **Action**
  - wrist extensor
  - Radial flexion
  - weak elbow flexor
Extensor carpi radialis longus (p162)

- **Origin**
  - humerus, lower 3rd of lateral supracondylar ridge and lateral epicondyle of humerus
- **Insertion**
  - Base of 2nd metacarpal (dorsal surface)
- **Action**
  - wrist extensor
  - radial flexion
  - weak elbow extensor

Extensor carpi ulnaris (p163)

- **Origin**
  - lateral epicondyle of humerus
- **Insertion**
  - Base of 5th metacarpal
- **Action**
  - Wrist extension
  - Ulnar flexion
  - weak elbow extensor

Extensor digiti minimi (p164)

- **Origin**
  - lateral epicondyle of the humerus
- **Insertion**
  - base of middle and distal phalanges of 5th finger (i.e. pinky)
- **Action**
  - ‘pinky’ extension
  - weak wrist extensor
Extensor digitorum (p165)

- Origin
  - Lateral epicondyle of humerus
- Insertion
  - bases of middle and distal phalanges of fingers
- Action
  - finger extension
  - wrist extension
  - weak elbow extensor

Flexor carpi radialis (p166)

- Origin: medial epicondyle of humerus
- Insertion: base of 2nd & 3rd metacarpals, anterior surface
- Action:
  - wrist flexion
  - radial flexion
  - weak elbow flexor

Flexor digitorum superficialis (p168)

- Origin
  - medial epicondyle of humerus
  - ulnar head: medial coronoid process
  - Radial head: upper two-thirds of anterior border of radius
- Insertion
  - lateral and medial sides of middle 3 phalanges (palmar surface)
- Action
  - finger flexion
  - wrist flexion
  - weak elbow flexor
Palmaris longus (p169)

- **Origin**
  - medial epicondyle of humerus
- **Insertion**
  - palmar aponeurosis
- **Action**
  - wrist flexion
  - weak elbow flexor

Flexor carpi ulnaris

- **Origin**
  - medial epicondyle of humerus
- **Insertion**
  - pisiform, hamate & base of 5th metacarpal
- **Action**
  - wrist flexion
  - ulnar flexion
  - weak flexor of elbow