

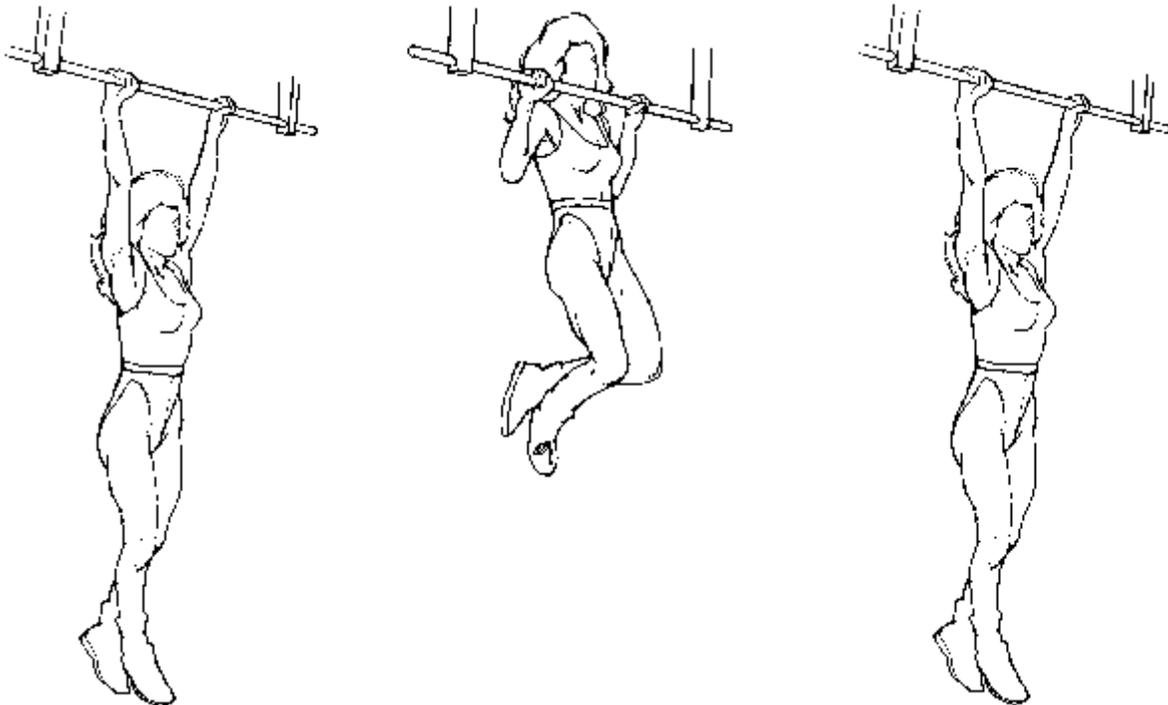
KIN 334 Functional Anatomy and Kinesiology  
Anatomical Analysis of Movement: Upper Extremity Exercises

**Instructions:** You are to perform an anatomical analysis of movement for the exercise shown below in the same manner as was done for the pull-ups example assignment handed out separately. Please look closely at the figure below for the “proper” way to perform this exercise for the purpose of this analysis. You may also wish to go to the SRC with a partner and demonstrate this exercise to each other and observe (please be careful with free weights!). Write your answers on the blank movement analysis form attached. Please write additional comments/explanations on the back of the table as needed. **Limit yourself to upper extremity joints only (i.e., shoulder girdle, shoulder joint, elbow joint, radioulnar joints, wrist joint, fingers and thumb joints).** Include intrinsic (and extrinsic) muscles of the hand as appropriate. You do not need to name individual intrinsic muscles of the hand; rather name them as a group according to their actions (e.g., “intrinsic finger flexors”). Please name the individual muscles for all other active upper extremity muscles.

Due Date: N.A.

**Do not turn in. This is an example of a previous assignment. (Solutions attached)**

### Pullups



KIN 334 Functional Anatomy and Kinesiology — Anatomical movement analysis (upper extremity muscles only)

Exercise: <b>Pull-ups (pronated)</b>			Date: 11/1/00	Your Name: <b>Solution</b>			
<b>Phase I (Raising the Body)</b>							
Joint	Joint Action	Segment being moved	Plane/axis	Force causing the motion	Active muscle(s)	Role	Type of muscle action
Fingers/Thumbs	none	none	none	N.A. (not applicable since no motion)	intrinsic and extrinsic finger flexors: FDS, FDP, FPL, FPB, APB, FDMB, OP, ODMB	agonists (for grip)	isometric (all)
Wrist	none	none	none	N.A.	“wrist-only” extensors: ECU, ECRB, ECRL	neutralizers of wrist flexion effects of FDS, FDP, FPL	isometric*
Radioulnar	none	none	none	N.A.	none needed (holding onto bar fixes orientation of this joint)	N.A.	N.A.
Elbow	flexion	forearm relative to upper arm	diagonal/oblique	muscle	brachialis, brachioradialis, biceps brachii, pronator teres	agonists	concentric
Shoulder joint	extension + adduction	upper arm rel. to scapula	diagonal/oblique	muscle	latissimus dorsi, teres major, posterior deltoid, pectoralis major (sternal)	agonists	concentric
					→ rotator cuff	stabilizers	isometric**
Shoulder girdle	downward rotation + depression + retraction	scapula rel. to spine or torso	diagonal/oblique	muscle	trapezius III, IV pectoralis minor, rhomboids, subclavius	agonists	concentric

Key to abbreviations:

Extrinsic finger and thumb flexors:  
 FDS: Flexor digitorum superficialis  
 FDP: Flexor digitorum profundus  
 FPL: Flexor pollicis longus

Intrinsic finger and thumb flexors:  
 FPB: Flexor pollicis brevis  
 APB: Abductor pollicis brevis  
 OP: Opponens pollicis  
 ODMB: Opponens digiti minimi brevis  
 FDMB: Flexor digiti minimi brevis

“Wrist-only” extensors:  
 ECU: Extensor carpi ulnaris  
 ECRB: Extensor carpi radialis brevis  
 ECRL: Extensor carpi radialis longus

Joint	Joint Action	Segment being moved	Plane/axis	Force causing the motion	Active muscle(s)	Role	Type of muscle action
Fingers/ Thumbs	none	none	none	N.A. (not applicable since no motion)	intrinsic and extrinsic finger flexors: FDS, FDP, FPL, FPB, APB, FDMB, OP, ODMB	agonists (for grip)	isometric (all)
Wrist	none	none	none	N.A.	“wrist-only” extensors: ECU, ECRB, ECRL	neutralizers of wrist flexion effects of FDS, FDP, FPL	isometric*
Radioulnar	none	none	none	N.A.	none needed (holding onto bar fixes orientation of this joint)	N.A.	N.A.
Elbow	extension	forearm relative to upper arm	diagonal/oblique	gravity	brachialis, brachioradialis, biceps brachii, pronator teres	agonists***	eccentric
Shoulder joint	flexion + abduction	upper arm rel. to scapula	diagonal/oblique	gravity	latissimus dorsi, teres major, posterior deltoid, pectoralis major (sternal)  → rotator cuff	agonists***  stabilizers	eccentric  isometric**
Shoulder girdle	upward rotation + elevation + protraction	scapula rel. to spine or torso	diagonal/oblique	gravity	trapezius III, IV, pectoralis minor, rhomboids, subclavius [NOTE: These are all the same exact muscles as Phase 1.]	agonists***	eccentric

\* The “isometric” designation ignores the very small extensor actions of the ECU, ECRB, ECRL at the elbow joint. Technically these muscles would act slightly eccentrically during phase 1 (during elbow flexion) and slightly concentrically during phase 2 (during elbow extension).

\*\* The four rotator cuff muscles (supraspinatus, subscapularis, teres minor, infraspinatus) are probably active to stabilize the shoulder joint and hold the humeral head firmly in the glenoid fossa. Three of these four muscles do not lengthen or shorten during pull-ups (and hence are listed as acting isometrically). The supraspinatus, however, lengthens with shoulder adduction and shortens with abduction. Hence, the supraspinatus action would be *eccentric* during phase 1 and *concentric* during phase 2.

\*\*\* While one might be tempted to call the role of these muscles *antagonists*, this term is reserved for when muscles are active to resist the action of other muscles (not gravity). So, I call them *agonists* for the movements they produced in phase 1 (and that gravity is overcoming in phase 2). I am not entirely sure there is a universally agreed-upon term for this type of action of muscles.