Muscles of the Upper Body
SETTING THE SCENE

Let’s get stuck into the muscles of the upper body – in fact, twenty muscles of the upper body! Where do they start, where do they end up and what do they do? It’s essential for all fitness professionals to know and understand where muscles attach and what actions they are responsible for at the joints. This is the basis of writing safe, effective, functional exercise programs that work!

Let’s have some fun using various learning techniques to learn the major muscles of the human body. We will learn the pronunciation then encourage you to use colour, draw the muscles on the body, and find someone to massage to really learn your muscles! By all means give your muscles a squeeze or a flex as you learn about them – as muscles are really cool!

The muscles of the upper body are an amazingly diverse group. They include the muscles on your chest, your shoulders, your mid and upper back, your arms and even your hands! Some of them are superficial, you can feel and squeeze these and others are deep spanning across the ribs, across the shoulder up to the cranium. Some of the muscles create movement at the shoulder complex or girdle (formed by the scapula, clavicle and humerus) by moving the shoulder and/or scapula.

Tip: muscles pull in the direction of the muscle fibre arrangement

Let’s take a look at the groupings of muscles now – these are presented together to gain a better understanding of how they function.
Muscles Moving the Scapula

The following muscles all attach onto various points of the scapula thus they must move the scapula when they contract. The movements available at the scapula are protraction, retraction, elevation, depression, upward and downward rotation.

The muscles we will address include:

- Trapezius
- Levator scapulae
- Serratus anterior
- Pectoralis minor
- Rhomboids
Muscles Moving the Shoulder

The following muscles all attach to various points along the humerus. Any muscle that attaches to the humerus will move the humerus producing movement at the glenohumeral (or shoulder) joint. The movements available at the shoulder are flexion, horizontal flexion, medial rotation, adduction, abduction, extension, horizontal extension, lateral rotation and circumduction.

- Latissimus dorsi
- Pectoralis major
- Deltoid
- Teres major
- Biceps brachii
- Triceps brachii
- Rotator cuff - supraspinatus, infraspinatus, teres minor, subscapularis
Muscles Moving the Elbow

The following muscles all attach to various points on the radius and ulna; therefore they are responsible for movements of the elbow.

The only movements available at the elbow are flexion and extension, with supination and pronation occurring at the radioulna joint.

- Biceps brachii
- Brachialis
- Triceps brachii
- Brachioradialis
Muscles Moving the Wrist, Hand and Fingers

The muscles that move the wrist, hand and fingers are many and varied due to the fine motor control required of the hands and fingers. The muscles referred to as the forearm flexors are located on the anterior aspect of the radius and ulna, whilst the forearm extensors can be found on the posterior aspect of the radius and ulna.

Muscles that attach to various points on the metacarpals and phalanges are responsible for movements of the wrist, hand and fingers. The wrist is a biaxial joint allowing movement in two planes; these movements are flexion and extension, and adduction and abduction. The interphalangeal joints are hinge joints allowing flexion and extension of the fingers.

- Forearm flexors
- Forearm extensors
MUSCLES THAT MOVE THE SCAPULA

The majority of the following muscles all insert at various points on the scapula, therefore they must move the scapula when they contract and shorten. Some also attach onto the skull hence move the neck and head which will be discussed in the session 'Muscles of the Trunk'.

The movements available at the scapula are protraction, retraction, elevation, depression, lateral (also known as upward) and medial (also known as downward) rotation.

On completing this section, be sure to consolidate your learning by completing the following Your Turn in your workbook:

Your Turn! Muscles that Move the Scapula
## Snapshot - Anterior View

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Joint/Body part</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pectoralis Minor</td>
<td>Ribs—anterior 3rd – 5th pair of ribs</td>
<td>Scapula Coracoid process</td>
<td>Scapula</td>
<td>Scapula Protraction &amp; Depression</td>
</tr>
<tr>
<td>Serratus Anterior</td>
<td>Ribs— upper 9 ribs</td>
<td>Scapula Medial border</td>
<td>Scapula</td>
<td>Scapula Protraction &amp; Lateral Rotation</td>
</tr>
</tbody>
</table>

![Muscle Anatomy Diagram](image)
## Snapshot - Posterior View

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Joint/Body part</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trapezius</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>Skull to the 12th Thoracic Vertebrae</td>
<td>Clavicle &amp; Scapula</td>
<td>Scapula</td>
<td>Scapula Elevation, Depression, Retraction and Rotation</td>
</tr>
<tr>
<td>Middle</td>
<td>Occipital bone and posterior ligaments of the neck</td>
<td>Clavicle</td>
<td></td>
<td>Scapula elevation, lateral rotation of neck &amp; neck extension</td>
</tr>
<tr>
<td></td>
<td>Spinous processes of 7th cervical and 1st-3rd thoracic vertebrae</td>
<td>Acromion process and spine of scapula</td>
<td></td>
<td>Scapula retraction, lateral rotation</td>
</tr>
<tr>
<td>Lower</td>
<td>4th-12th thoracic vertebrae</td>
<td>Spine of scapula</td>
<td></td>
<td>Scapula depression</td>
</tr>
<tr>
<td><strong>Leverator</strong></td>
<td>Cervical Vertebrae C1 - C4 transverse processes</td>
<td>Scapula superior</td>
<td>Scapula and neck</td>
<td>Scapula elevation Lateral flexion of neck Neck extension</td>
</tr>
<tr>
<td><strong>Scapulae</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rhomboids</strong></td>
<td>Thoracic vertebrae</td>
<td>Scapula</td>
<td>Scapula</td>
<td>Scapula Retraction &amp; Medial rotation</td>
</tr>
<tr>
<td>Minor</td>
<td>C7-T1 spinous processes</td>
<td>Medial border</td>
<td></td>
<td>Retraction</td>
</tr>
<tr>
<td>Major</td>
<td>T2-T5 spinous processes</td>
<td>Medial border &amp; inferior angle</td>
<td></td>
<td>Retraction &amp; medial rotation</td>
</tr>
</tbody>
</table>
Trapezius

Derivation trapezium (shape)

Attachments

In simple terms:

Skull, cervical and thoracic vertebra to the Clavicle and scapula

Specifically:

Upper fibres: occipital bone, ligamentum nuchae and the SP of C7 to the Clavicle

Middle fibres: SP of T1-T5 to the Acromion process

Lower fibres: SP of T6-T12 to the Spine of scapula

Actions

Elevation of the scapula (upper fibres) as in a shoulder shrug
Retraction of the scapula (middle fibres) as in a wide seated row
Depression of the scapula (lower fibres) as seen in a wide grip lat pulldown
Lateral/upward rotation (middle and lower fibres) as seen in a shoulder press
Rhomboids Major and Minor

Derivation  
rhomb – rhombus (the geometric shape)  
oid – shape, resemblance  
major – larger  
minor – smaller

Attachments

In simple terms:

Thoracic vertebra  
to the  
Scapula

Specifically:

Minor: SP of C7-T1 and the inferior part of ligamentum nuchae  
to the  
Root of the spine of the scapula

Major: SP of T2-5  
to the  
Between the root of the spine of the scapula and the inferior angle of the scapula

Actions

Retraction of the scapula as in a wide seated row  
Elevation of the scapula as in a shoulder shrug  
Medial/downward rotation of the scapula
**Levator Scapulae**

Derivation      levator – lifter
scapulae – scapula

**Attachments**

In simple terms:

Cervical vertebrae to the Scapula

Specifically:

Transverse processes (TP) of C1-C4 and posterior tubercles of the TP of C1 and C4 to the Medial border of the scapula, from the superior angle to the root of the spine of the scapula

**Actions**

Elevation of the scapula
Downward rotation of the scapula
Retraction of the scapula
**Serratus Anterior**

Derivation  
serratus – saw  
anterior – in front of

**Attachments**

In simple terms:

Anterior surface of ribs 1-9  
*to the*  
Anterior surface of the medial  
border of the scapula

**Actions**

Protration of the scapula as seen in an upper body pushing exercise  
Lateral/upward rotation of the scapula  
Elevation of the scapula  
Depression of the scapula
**Pectoralis Minor**

Derivation  pectoralis – chest

minor – smaller

**Attachments**

In simple terms:

Ribs  

to the  Scapula

Specifically:

Ribs 3-5  

to the  Coracoid process of the scapula

**Actions**

Scapula protraction
Scapula depression
Elevates ribs 3-5
Downward rotation of the scapula
MUSCLES THAT MOVE THE SHOULDER

The shoulder (glenohumeral) joint is a ball and socket joint, therefore, allows multiple movements in many directions. Due to the many movements available at the shoulder, we have many muscles that cross the shoulder joint.

As a general rule, muscles that can be viewed from an anterior view of the skeleton pull the humerus forward and down and hence are involved in:

- shoulder flexion,
- horizontal flexion,
- adduction,
- medial rotation.

Muscles that are viewed from a posterior aspect pull the humerus backward and down and hence are involved in:

- extension,
- horizontal extension,
- adduction,
- lateral rotation.

However, some actions can be performed by muscles that originate from both anterior and posterior areas of the skeleton (e.g., adduction can be performed by both pectoralis major from the anterior and latissimus dorsi from the posterior while latissimus dorsi can medially rotate the humerus).

On completing this section, be sure to consolidate your learning by completing the following Your Turn in your workbook:

Your Turn! Muscles that Move the Shoulder
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Joint</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pectoralis Major</td>
<td>Sternum, Clavicle &amp; Ribs</td>
<td>Humerus</td>
<td>Shoulder</td>
<td>Horizontal Flexion, Shoulder Flexion, Adduction &amp; Medial Rotation</td>
</tr>
<tr>
<td>Deltoid</td>
<td>Clavicle &amp; Scapula</td>
<td>Humerus</td>
<td>Shoulder</td>
<td>Shoulder Flexion, Horizontal Flexion, Abduction, Horizontal Extension</td>
</tr>
<tr>
<td>Anterior</td>
<td>Clavicle</td>
<td>Lateral proximal humerus</td>
<td></td>
<td>Flexion, horizontal flexion, medial rotation</td>
</tr>
<tr>
<td>Middle</td>
<td>Acromion process</td>
<td>Lateral proximal humerus</td>
<td></td>
<td>Abduction</td>
</tr>
<tr>
<td>Posterior</td>
<td>Spine of scapula</td>
<td>Lateral proximal humerus</td>
<td></td>
<td>Extension, horizontal extension, lateral rotation</td>
</tr>
<tr>
<td>Biceps Brachii</td>
<td>Scapula</td>
<td>Radius</td>
<td>Shoulder &amp; Elbow</td>
<td>Shoulder Flexion, Elbow Flexion &amp; Supination of the Forearm</td>
</tr>
<tr>
<td>Long head</td>
<td>Superior glenoid cavity</td>
<td>Radial tuberosity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Head</td>
<td>Coracoid process</td>
<td>Radial tuberosity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Snapshot - Posterior View**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Joint</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latissimus Dorsi</td>
<td>Sacrum, lumbar vertebrae and lower 7 thoracic vertebrae (via thoraco-lumbar fascia)</td>
<td>Humerus Anterior Proximal</td>
<td>Shoulder</td>
<td>Extension, Adduction, Medial rotation, Horizontal extension</td>
</tr>
<tr>
<td>Teres Major</td>
<td>Scapula Inferior angle</td>
<td>Humerus Anterior proximal</td>
<td>Shoulder/Scapula</td>
<td>Extension, Adduction &amp; Medial Rotation</td>
</tr>
<tr>
<td>Rotator Cuff Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supraspinatus</td>
<td>Above the scapula spine</td>
<td>Humerus Head</td>
<td>Shoulder</td>
<td>Lateral &amp; Medial Rotation</td>
</tr>
<tr>
<td>Infra spinatus</td>
<td>Below the scapula spine</td>
<td></td>
<td></td>
<td>Abduction</td>
</tr>
<tr>
<td>Teres Minor</td>
<td>Lateral border of scapula</td>
<td></td>
<td></td>
<td>Lateral rotation</td>
</tr>
<tr>
<td>Subscapularis</td>
<td>Anterior surface of scapula</td>
<td></td>
<td></td>
<td>Medial rotation</td>
</tr>
<tr>
<td>Triceps Brachii</td>
<td>Scapular &amp; Humerus</td>
<td>Ulna</td>
<td>Shoulder/Elbow</td>
<td>Shoulder Extension Elbow Extension</td>
</tr>
<tr>
<td>Long Head</td>
<td>Infraglenoid cavity of scapula</td>
<td>Olecranon of ulna</td>
<td>Shoulders extension &amp; elbow extension Elbow extension</td>
<td></td>
</tr>
<tr>
<td>Medial Head</td>
<td>Lateral posterior humerus</td>
<td>Olecranon of ulna</td>
<td></td>
<td>Elbow extension</td>
</tr>
<tr>
<td>Lateral Head</td>
<td>Lateral posterior humerus</td>
<td>Olecranon of ulna</td>
<td></td>
<td>Elbow extension</td>
</tr>
</tbody>
</table>
Pectoralis Major

Derivation
pectoralis – chest
major – larger

Attachments

In simple terms:

Sternum, clavicle and ribs to the Humerus

Specifically:

Medial clavicle, sternum and the costal cartilages of ribs 1-7 to the Bicipital groove of the humerus

Actions

Shoulder flexion as you can feel when you lift your arm but is more involved from an extended position to neutral as in the up phase of a bench dip
Horizontal shoulder flexion (clavicular head) as shown in the diagram to the right which is evident in many pushing exercises
Shoulder adduction as in a standing cable fly finishing in front of the thighs Medial shoulder rotation as you can feel if you turn your thumb inwards
Shoulder extension (from flexed to neutral)
Deltoid

Derivation  delta – the letter delta
              oid – resemblance

Attachments

In simple terms:

Clavicle and scapula  to the  Humerus

Specifically:

Lateral clavicle, acromion process and the spine of scapula  to the  Deltoid tuberosity of the humerus

Actions

Shoulder abduction (entire muscle with more emphasis on the middle fibres) as performed in a lateral raise
Shoulder flexion (anterior) as performed in a front raise
Shoulder extension (posterior) as performed in a pulldown
Horizontal shoulder flexion (anterior) as evident in pushing exercises
Horizontal shoulder extension (posterior) as evident in rowing exercises
Medial shoulder rotation (anterior) as can be felt when you turn the thumb inwards
Lateral shoulder rotation (posterior) as can be felt when you turn the thumb outwards
Latissimus Dorsi

Derivation      latissimus – widest
dorsi – back

**Attachments**

In simple terms:

Lower thoracic vertebra, lumbar vertebra, sacrum and ilium  
*to the*  Humerus

Specifically:

Spinous processes of T7 to T12 and L1 to L5, sacrum, posterior iliac crest, thoracolumbar fascia,  
*to the*  Bicipital groove of the lowest 3 or 4 ribs and the inferior angle of the scapula

**Actions**

Shoulder extension as performed in a chin-up or narrow grip lat pulldown
Shoulder adduction as performed in a wide grip lat pulldown
Horizontal shoulder extension as performed in a wide seated row
Medial shoulder rotation
**Teres Major**

The ‘lats’ little helper!

**Derivation**  
teres – round  
major – large

**Attachments**

In simple terms:

Scapula  
*to the*  
Humerus

Specifically:

The inferior third of the dorsal surface of the inferior lateral border *to the* of the scapula  
Medial lip of the bicipital groove of the humerus

**Actions**

Shoulder adduction  
Shoulder extension  
Medial shoulder rotation
Rotator Cuff (SITS)

The rotator cuff muscles compose of supraspinatus, infraspinatus, teres minor (posteriorly on the scapula) and subscapularis (anteriorly on the scapula). Together they encompass the head of the humerus and a key action is to stabilise the head of the humerus in the glenoid cavity.

Supraspinatus

The supraspinatus is located in the supraspinous fossa, deep to the trapezius’ upper fibres. Its belly runs underneath the acromion and attaches to the humerus’ greater tubercle. The supraspinatus assists the deltoid with abduction of the shoulder and is the only muscle of the group not involved in shoulder rotation.

Other actions – shoulder abduction

Infraspinatus

The flat, convergent belly of infraspinatus is located in the infraspinous fossa. Most of its belly is superficial with a medial portion deep to the trapezius and a lateral portion beneath the deltoid. The infraspinatus attaches immediately posterior to the supraspinatus on the greater tubercle and is a synergist with the teres minor in lateral rotation of the shoulder.

Other actions – lateral shoulder rotation, involved in shoulder adduction/extension/horizontally extension
**Teres Minor**

The teres minor is a small muscle squeezed between the infraspinatus and teres major. It is located high in the axilla.

The teres minor and teres major are antagonists in rotation of the humerus.

Other actions – as for infraspinatus

**Subscapularis**

The deep subscapularis, located in the scapula’s anterior surface, is sandwiched between the subscapular fossa and serratus anterior muscle. With only a small portion of its muscle belly accessible, the subscapularis is the only rotator cuff muscle that attaches to the humerus’ lesser tubercle. It rotates the shoulder medially.

Other actions – medial shoulder rotation
MUSCLES THAT MOVE THE ELBOW

The following muscles all insert at various points on the radius and ulna, therefore, they are responsible for movements of the elbow. The only movements available at the elbow are flexion and extension, with supination and pronation occurring at the radio-ulna joint.

On completing this section, be sure to consolidate your learning by completing the following Your Turn in your workbook:

Your Turn! Muscles that Move the Elbow
# Snapshot - Anterior and Posterior Views

## Snapshot - Anterior View

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Joint</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps Brachii</td>
<td>Scapula</td>
<td>Radius</td>
<td>Shoulder/Elbow</td>
<td>Shoulder Flexion</td>
</tr>
<tr>
<td></td>
<td>Long head</td>
<td>Superior glenoid cavity</td>
<td>Radial tuberosity</td>
<td>Elbow Flexion &amp; Supination</td>
</tr>
<tr>
<td></td>
<td>Short Head</td>
<td>Coracoid process</td>
<td>Radial tuberosity</td>
<td>Shoulder flexion, elbow flexion &amp; supination</td>
</tr>
<tr>
<td>Brachialis</td>
<td>Humerus</td>
<td>Ulna</td>
<td>Elbow</td>
<td>Elbow flexion</td>
</tr>
<tr>
<td></td>
<td>Distal anterior</td>
<td>Proximal anterior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brachioradialis</td>
<td>Humerus</td>
<td>Radius</td>
<td>Elbow</td>
<td>Elbow flexion</td>
</tr>
<tr>
<td></td>
<td>Distal lateral</td>
<td>Distal lateral</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Snapshot - Posterior View

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Joint</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triceps Brachii</td>
<td>Scapula</td>
<td>Ulna</td>
<td>Shoulder/Elbow</td>
<td>Shoulder Extension</td>
</tr>
<tr>
<td>Long head</td>
<td>Infraglenoid cavity</td>
<td>Olecranon of ulna</td>
<td></td>
<td>Elbow Extension</td>
</tr>
<tr>
<td>Lateral Head</td>
<td>Lateral posterior humerus</td>
<td>Olecranon of ulna</td>
<td></td>
<td>Elbow extension</td>
</tr>
<tr>
<td>Medial Head</td>
<td>Posterior humerus</td>
<td>Olecranon of ulna</td>
<td></td>
<td>Elbow extension</td>
</tr>
</tbody>
</table>
Biceps Brachii

Derivation
bi – two
cep – head
brachii – refers to the arm

Attachments

In simple terms:
Scapula \(\rightarrow\) Radius

Specifically:
Long head: supraglenoid tubercle of the scapula \(\rightarrow\) Radial tuberosity
Short head: coracoid process of the scapula \(\rightarrow\) Radial tuberosity

Actions

Elbow flexion as performed in a biceps curl
Forearm supination as felt when you turn your palm upwards
Shoulder flexion as felt when you lift your arm
Brachialis and Brachioradialis

Brachialis

Derivation: brachialis – refers to the arm

Attachments

In simple terms:

Humerus to the Ulna

Specifically:

Distal half of the anterior shaft of the humerus to the Ulnar tuberosity

Actions

Elbow flexion
Supinates the forearm to mid-supine
Pronates the forearm to mid-prone

Brachioradialis

Derivation: brachio – refers to the arm
radialis – radius

Attachments

In simple terms:

Humerus to the Radius

Specifically:

Lateral supracondylar ridge of the humerus to the Styloid process of the radius

Actions

Elbow flexion
Supinates the forearm to mid-supine
Pronates the forearm to mid-prone
Triceps Brachii

Derivation  tri – three
cep – head
brachii – refers to the arm

Attachments

In simple terms:

Scapula and humerus  to the  Ulna

Specifically:

Long head: infraglenoid tubercle of the scapula  to the  Olecranon process of the ulna

Lateral head: posterior shaft of the humerus  to the  Olecranon process of the ulna

Medial head: Posterior shaft of the humerus  to the  Olecranon process of the ulna

Actions

Elbow extension as performed in a triceps pushdown but also in many pushing exercises
Shoulder extension (long head) as felt in pulldowns
Shoulder adduction (long head) as felt in a standing cable fly
MUSCLES THAT MOVE THE WRIST, HAND & FINGERS

The muscles that move the wrist, hand and fingers are many and varied due to the fine motor control required of the hands and fingers. As a health and fitness professional be aware of the many muscles that contribute to the forearm musculature.

The muscles referred to as the forearm flexors are located on the anterior aspect of the radius and ulna, whilst the forearm extensors can be found on the posterior aspect of the radius and ulna. These muscles insert at various points on the metacarpals and phalanges, therefore, they are responsible for movements of the wrist, hand and fingers.

The wrist is a biaxial joint allowing movement in two planes, these movements are flexion, extension, adduction and abduction. The inter-phalangeal joints are hinge joints allowing flexion and extension of the fingers.
### Snapshot - Anterior View

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
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<th>Joint</th>
<th>Action</th>
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</thead>
<tbody>
<tr>
<td>Forearm Flexors</td>
<td>Humerus Medial epicondyle</td>
<td>Metacarpals &amp; Phalanges</td>
<td>Wrist/Finger</td>
<td>Wrist Flexion, Wrist Abduction and Adduction, Finger Flexion</td>
</tr>
</tbody>
</table>

### Snapshot - Posterior View

<table>
<thead>
<tr>
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<th>Origin</th>
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<th>Action</th>
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<tbody>
<tr>
<td>Forearm Extensor</td>
<td>Humerus Lateral epicondyle</td>
<td>Metacarpals &amp; Phalanges</td>
<td>Wrist/Finger</td>
<td>Wrist Extension, Abduction and Adduction Finger Flexion</td>
</tr>
</tbody>
</table>
Forearm Flexors

Attachments

In simple terms:

Humerus, ulna and radius to the Carpals, metacarpals and phalanges

Specifically:

E.g., Flexor carpi radialis

Medial epicondyle of the humerus via the common flexor tendon to the Anterior surface of the second and third metacarpals

Actions

Wrist flexion
Interphalangeal flexion
Metacarpophalangeal flexion
Forearm Extensors

Attachments

In simple terms:

Humerus and ulna to the Metacarpals and phalanges

Specifically:

E.g., Extensor digitorum

Lateral epicondyle of the humerus to the Posterior surface of the middle and distal phalanges of four fingers via the common extensor tendon

Actions

Wrist extension
Interphalangeal extension
Metacarpophalangeal extension
MOVEMENT ANALYSIS

Understanding how the body moves (biomechanics), is crucial to safe exercise selection and effective program design. To understand biomechanics, you need a good grasp of anatomy, especially the muscle attachments and joint movements/actions.

Now that we have some knowledge of joints, the muscles that cross these joints, the movements that occur at joints when muscles contract and shorten, we can begin to analyse any human movement pattern.
Let's Revisit JAM

We introduced JAM in an earlier session where we focused on the joint actions. Let’s now show how M for muscle is identified using a biceps curl example.

<table>
<thead>
<tr>
<th>JAM</th>
<th>Description</th>
<th>Bicep Curl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint</td>
<td>Refers to the joints moving - list all the joints/body parts moving from proximal to distal</td>
<td>Elbow</td>
</tr>
<tr>
<td>Action</td>
<td>Refers to the actions at those joints (also known as joint movements) - describe the joint action in the concentric phase</td>
<td>Elbow flexion</td>
</tr>
<tr>
<td>Muscle</td>
<td>Refers to the muscles creating those actions - identify which muscles cross that joint and could produce the movement</td>
<td>Biceps brachii, brachialis, brachioradialis</td>
</tr>
</tbody>
</table>

Role of the Muscles

The next step is to then identify the role of each muscle in the movement (agonist, antagonist, fixator or synergist). In the bicep curl example, the biceps brachii is the agonist and the brachialis and brachioradialis assist hence are synergists. Of course, these are not the only muscles working. The trunk stabilisers function as fixators, the forearm flexors are also fixators to keep your wrist still (explaining why your forearm hurts after bicep curls!). The latissimus dorsi contracts isometrically as a synergist to prevent the elbows moving forwards.

Isolated vs Compound

An isolated exercise is easier to analyse because only a single joint is moving. The analysis for multi-joint movements (compound exercises) will of course involve many more muscles. But here is the rule of thumb, there is an agonist for every moving joint. In the situation where three joints move and there are three agonists (one for each moving joint), we then identify which muscle would be contributing the most to the movement and that muscle is known as the number 1 target muscle and ..... the key reason for prescribing that exercise.

For example, in a push-up, there are three agonists as follows:

- Serratus anterior to protract the scapula
- Pectoralis major to horizontally flex the shoulder (assisted by anterior deltoid)
- Triceps brachii to extend the elbow

As you already know, the key reason we prescribe a push-up is for the pectoralis major hence it would be considered the number 1 target muscle (followed by triceps then serratus anterior based on their contribution to the movement). However, it is good to know that the other muscles are involved. For example, we know that compound pushing exercises also work the triceps so we may not need to include a triceps exercise depending on the wants and goals of the program.
Upper Body Movement Analysis

In starting our movement analysis, let’s stick to the KISS principle – keep it simple. We will analyse both isolated and compound exercises. Remember for compound to just analyse each joint one at a time from proximal to distal.

**Exercise 1 – Dumbbell Chest Fly (concentric is up)**

<table>
<thead>
<tr>
<th>Joint</th>
<th>Action</th>
<th>Muscle/s</th>
<th>Role/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>Horizontal shoulder flexion</td>
<td>Pectoralis major</td>
<td>Agonist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anterior deltoide</td>
<td>Assistant synergist</td>
</tr>
</tbody>
</table>

**Exercise 2 – Bench Press (concentric is up)**

<table>
<thead>
<tr>
<th>Joint</th>
<th>Action</th>
<th>Muscle/s</th>
<th>Role/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scapula</td>
<td>Scapula protraction</td>
<td>Serratus anterior</td>
<td>Agonist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pectoralis minor</td>
<td>Assistant synergist</td>
</tr>
<tr>
<td>Shoulder</td>
<td>Horizontal shoulder flexion</td>
<td>Pectoralis major</td>
<td>Agonist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anterior deltoide</td>
<td>Assistant synergist</td>
</tr>
<tr>
<td>Elbow</td>
<td>Elbow extension</td>
<td>Triceps brachii</td>
<td>Agonist</td>
</tr>
</tbody>
</table>

NB: it doesn’t matter where the elbow is in space – whether it is up in the air or out to the side – if it straightens while overcoming resistance, it is extending!

Out of the agonists listed, the number 1 target muscle is pectoralis major – the key reason for performing the push-up.

**Exercise 3 – Wide Seated Row (concentric is backwards)**

<table>
<thead>
<tr>
<th>Joint</th>
<th>Action</th>
<th>Muscle/s</th>
<th>Role/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>Horizontal shoulder extension</td>
<td>Posterior deltoide</td>
<td>Agonist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Latissimus dorsi</td>
<td>Assistant synergist</td>
</tr>
<tr>
<td>Elbow</td>
<td>Elbow flexion</td>
<td>Biceps brachii</td>
<td>Agonist</td>
</tr>
<tr>
<td>Scapula</td>
<td>Scapula retraction</td>
<td>Mid trapezius</td>
<td>Agonist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rhomboids</td>
<td>Assistant synergist</td>
</tr>
</tbody>
</table>

Out of the agonists listed, the two main target muscle would be posterior deltoid (acting on the shoulder) and mid trapezius (retracting the scapula).
Quick Quiz

So now it's your turn to analyse some upper body exercises. Complete the JAM tables below for both isolated and compound exercises – we have helped you by providing the moving joints from proximal to distal. If you prefer to write the answers in, remember that you can print these pages when you open the session PDF.

Exercise 1 – Triceps Pushdown (concentric is _________)

<table>
<thead>
<tr>
<th>Joint</th>
<th>Action</th>
<th>Muscle/s</th>
<th>Role/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elbow</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exercise 2 – Push-up (concentric is _________)

<table>
<thead>
<tr>
<th>Joint</th>
<th>Action</th>
<th>Muscle/s</th>
<th>Role/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scapula</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exercise 3 – Seated Row - close grip (concentric is _________)

<table>
<thead>
<tr>
<th>Joint</th>
<th>Action</th>
<th>Muscle/s</th>
<th>Role/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scapula</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You will find the answers in Session 12 videos.
Congratulations – you did it!

   Muscles that move the scapula
   Muscles that move the shoulder
   Muscles that move the elbow
   Muscles that move the wrist

If you are feeling a little overwhelmed after learning twenty upper body muscles and what they do, don’t worry, that is very normal after a big anatomy session. To reinforce your learning, we will put this anatomy and movement analysis into action in the gym which is essential for kinaesthetic learning.

The following resources were used in the compilation of this session:
