# The Muscular System Manual

## The Skeletal Muscles of the Human Body

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## Upper Extremity

- Muscles of the Shoulder Girdle Joints
- Muscles of the Glenohumeral Joint
- Muscles of the Elbow and Radioulnar Joints
- Muscles of the Wrist Joint
- Extrinsic Muscles of the Finger Joints
- Intrinsic Muscles of the Finger Joints

## Axial Body

- Muscles of the Spinal Joints
- Muscles of the Rib Cage Joints
- Muscles of the Temporomandibular Joints
- Muscles of Facial Expression

## Lower Extremity

- Muscles of the Hip Joint
- Muscles of the Knee Joint
- Muscles of the Ankle and Subtalar Joints
- Extrinsic Muscles of the Toe Joints
- Intrinsic Muscles of the Toe Joints

## Functional Mover Groups

- Functional Groups of Muscles
The Muscular System Manual: The Skeletal Muscles of the Human Body, 4th edition, is meant to be the most thorough atlas of muscle function that is available. Instead of simply listing muscle attachments and actions that are typically taught, The Muscular System Manual comprehensively covers all muscle functions of each muscle. Shortening action functions with their reverse actions are addressed, as well as eccentric and stabilization functions. By offering the student the full picture of muscle function, it actually makes the task of learning the muscles easier, not harder. Students can grasp the information more quickly because they understand it and do not have to memorize it.

WHO WILL BENEFIT FROM THIS BOOK?
This book is primarily written for students and practicing therapists of manual and movement therapies, including massage therapy, physical therapy, chiropractic, osteopathy, orthopedists, athletic training, yoga, Pilates, and Feldenkrais. However, anyone who needs to learn the skeletal muscles of the body will find this book invaluable and essential. Unlike many books, you will not outgrow The Muscular System Manual. It will be your guide as you first learn the muscles of the body, and it will remain an invaluable resource on your bookshelf for as long as you are in practice.

CONCEPTUAL APPROACH
The approach taken by The Muscular System Manual is unique. Instead of simply listing information, it teaches the information and makes it understandable, allowing for true critical thinking. The beginning chapters set the framework for how muscles work as well as give a five-step approach to learning muscles. Each individual muscle then has notes that explain how the actions can be reasoned out instead of memorized. The goal of this book is to enable the student/therapist/trainer/physician to be able to critically think through muscle functioning when working clinically with clients and patients.

ORGANIZATION
The Muscular System Manual is organized into five Parts. Part 1 covers the basic language of kinesiology that the student needs to be able to understand muscle attachments and functions and also communicate with other members of the health care and fitness fields. Parts 2 through 4 systematically cover each of the major muscles of the body, presenting in a clear and organized manner the essential information of every muscle. The beginning of each chapter in these parts opens with large group illustrations of the muscles of the joint region. Each muscle then has an individual layout in which the muscle’s attachments, functions, innervation, arterial supply, palpation, relationship to other structures, and other miscellaneous information that is intellectually and clinically relevant are given. Part 5 presents illustrations of all the major functional joint action mover groups of muscles as well as illustrations of the muscles of the pelvic floor and myofascial meridians of the body.

DISTINCTIVE FEATURES OF THIS BOOK
There are many features that distinguish this book:
• The most thorough coverage of muscle function available.
• Explanations to understand the muscle’s actions that promote critical thinking.
• Full referencing for all joint actions.
• Information presented in a layered à la carte approach that allows each student or instructor to determine what content is covered.
• Beautiful illustrations in which the bones and muscles are placed on a photograph of a real person.
• Large group illustrations for every functional group.
• Myofascial meridian information for every muscle.
• Bulleted clear and easy-to-follow palpations for each muscle.
• An interactive digital program on Evolve that allows for any combination of muscles to be placed on the skeleton and body.

NEW TO THIS EDITION
All features of the 3rd edition have been preserved; the 4th edition of The Muscular System Manual has many new features:
• Evidence-based full referencing for all joint actions of the muscles.
• Expanded coverage of muscle function to address the oblique plane motion patterns of the muscles.
• A flashcard app that offers a portable resource for studying more than 250 flashcards, which include coverage of muscles, muscle locations, pronunciations, attachments, actions, and innervation information.
• New illustrations for the muscle attachments and myofascial meridians, as well as for many of the muscles.
• A concise review of all organ systems of the body.
• Digital access to video demonstrations of the palpation of all the muscles of the body.
• An interactive customized digital program that allows stretches of the individual muscles to be printed out for self-care use or for use with patients/clients.

LEARNING AIDS
• The attachment and functions information is presented in a layered à la carte approach that allows the student to decide at what depth to learn the information.
This book is meant to be used not only as a textbook, but also as an in-class manual. For this reason, checkboxes are provided for each muscle layout as well as each piece of information. This allows the student to check off exactly what content will be learned. Instructors, having students check off content covered, allows for extremely clear expectations of what they are responsible for.

Arrows are placed over the muscle for each individual muscle illustration so that the line of pull of the muscle can be seen and visually understood. This allows for the actions of the muscle to be understood instead of memorized.

A Miscellaneous section is provided that offers interesting insights to each muscle. Many of these are clinical applications that flesh out and make learning the muscle more interesting.

**EVOLVE ONLINE RESOURCES**

This book is backed up by an Evolve website that includes the following student resources:

- An interactive digital program that is simple, thorough, and easy to use. A base photograph of the region of the body is presented with the skeleton drawn in. A list of every muscle of that region is given and you can choose any combination of muscles and place them onto the illustration, allowing you to not only see that muscle’s attachments, but more importantly, to be able to see the relationship between all the muscles of the region. Any combination of muscles can be chosen!
- Video demonstrations by the author showing palpation of each and every muscle of the book.
- An audio feature in which the author reads aloud the names, attachments, and major actions of all the muscles. This allows for studying while commuting or for use with an MP3 device. Ideal for studying and learning while on the go!
- Interactive review exercises such as Drag ‘n’ Drop labeling exercises and Name That Muscle quizzes for further review of the skeletal muscles of the human body.
- 200 short-answer review questions to reinforce knowledge learned in the book.
- An interactive customized digital program that allows stretches of the individual muscles to be printed out for self-care use or for use with patients/clients.
- A concise review of all organ systems of the body.
- Supplemental appendices featuring valuable information on the following topics: soft tissue attachments, palpation guidelines, overview of innervation, overview of arterial supply, additional skeletal muscles, and mnemonics for remembering muscle names.

**OTHER RESOURCES**

For instructors, the entire book is available in 50-minute PowerPoint lectures, with learning outcomes, discussion topics, and critical thinking questions. There is also an instructor’s manual that provides step-by-step approaches to leading the class through learning the muscles, as well as case studies that allow for a critical thinking application of the muscles to common musculoskeletal conditions. Further, a complete image collection that contains every figure in the book, and a test bank in ExamView containing 1,500 questions, are provided.

**RELATED PUBLICATIONS**


**NOTE TO THE STUDENT**

This book is thick and packed with information. You can choose exactly how much you want to learn. If you are a beginner to learning muscles, the outstanding illustrations and the simple and clear explanations will make learning muscles easy. If you are an advanced student of the muscular system, the depth of information will help you reach new levels of knowledge and clinical application. You will not outgrow this book. Whether as an in-class manual or a reference text for your bookshelf, you will find this book to be an ideal and essential book now and into the future!
HOW TO USE THIS BOOK

1. Muscle and Group Name (if applicable), covered in a 2- to 3-page spread.

2. Illustration of individual muscle, with arrows indicating lines of pull. Bony attachments are shaded in brown for easy identification. Muscle is deep to (behind) a bone from this. Figures are full color anatomic illustrations of muscles and bones drawn over photographs to help identify positions of the structures. The positions of muscles and bones in the human body are unmistakable in this overlay artwork.

3. Checkboxes are used throughout the 2-to 3-page individual muscle spreads so you can mark information to be covered or check it off once you have learned the material.

4. A first look at the name of the muscle to see what free information the name gives us.

5. Derivation and proper pronunciation of the muscle are provided here.

6. Simple attachment (origin) information. (Note: For illustrations of bones, bony landmarks, and muscle attachment sites, see Chapter 2.)

7. More detailed attachment (origin) information.

8. Simple attachment (insertion) information. (Note: If more detailed attachment [insertion] information is present, it will follow directly after this section.)

9. Functions section: This section covers every contraction function of the muscle. This information serves to make The Muscular System Manual more complete, giving a comprehensive presentation of musculoskeletal function. (Note: For an explanation of muscle function, see Chapter 3.)

10. Concentric (Shortening) Mover Actions table: The actions (standard and reverse) that are usually taught at a beginning or intermediate level are in bold print within the table. The remaining actions within the table are for more advanced levels of learning. (Note: For illustrations of joint actions, see Chapter 1.)

11. Standard Mover Action notes: Methodology information that explains the reasoning behind each of the muscle’s standard actions.
Reverse Mover Action notes: Methodology information that explains the reasoning behind each of the muscle’s reverse actions.

Motions: The oblique plane motion(s) of the muscle is given here to better understand the true motion pattern(s) of the muscle.

Eccentric and Isometric Functions and Notes: The importance of core stabilization (isometric contraction) in exercise and rehabilitation has become increasingly understood in recent years, and negative (eccentric) contractions are used more and more in exercise. Coverage of this information is unique to this book.

Additional notes on the muscle’s actions are given here.

Innervation: Two levels of detail are provided, with the predominant spinal levels shown in bold print.

Arterial Supply section: Two levels of detail are provided. (Note: Arterial supply to muscles is extremely variable. Although specific information is provided here, this variability must be kept in mind when learning this material.)

Palpation section: Easy-to-follow numbered steps to palpate the muscle. See the Evolve website for more in-depth video palpation protocols for the muscle palpation guidelines.

Relationship section: Gives information regarding the muscle’s anatomic relationship to other musculoskeletal structures.

Miscellaneous: In this section, interesting information about the muscle and clinical applications are given.
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- Trapezius
- Acromion process of scapula
- Deltoid
- Scapula
- Serratus anterior

Figure 4-3
Thenar Eminence Group

Organization of the Thenar Muscles

The thenar eminence is an eminence of soft tissue located on the radial side of the palm of the hand. There are three muscles in the thenar eminence group: the abductor pollicis brevis, flexor pollicis brevis, and opponens pollicis.

Attachments

- All three thenar muscles attach proximally onto the flexor retinaculum and carpal bones.
- All three thenar muscles attach distally onto the thumb.
  - The abductor pollicis brevis and the flexor pollicis brevis attach onto the proximal phalanx of the thumb.
  - The opponens pollicis attaches onto the metacarpal of the thumb.

Functions

- All three thenar muscles move the thumb.
- In each case, the name of the muscle indicates its major joint action.

Miscellaneous

1. The layering of the thenar muscles is approximately as follows: The abductor pollicis brevis is the most superficial of the three. The flexor pollicis brevis is intermediate. The opponens pollicis is the deepest of the three.
2. There are three muscles located in the hypothenar eminence that are analogous to the thenar muscles. The three hypothenar muscles are the abductor digiti minimi manus, flexor digiti minimi manus, and opponens digiti minimi.
3. The thenar muscles are located within the deep front arm line myofascial meridian.

Innervation

- The three thenar muscles are innervated by the median nerve. (The ulnar nerve usually contributes to a small degree.)

Arterial Supply

- The three thenar muscles receive their arterial supply from the radial artery.

Figure 9-5 Anterior views of the right thenar group muscles. A, Superficial view.
Thenar Eminence Group—cont’d

Figure 9-5, cont’d B, Deep view. The abductor pollicis brevis and flexor pollicis brevis have been cut. APB, Abductor pollicis brevis; FPB, flexor pollicis brevis; OP, opponens pollicis.
Biceps Femoris (of Hamstring Group)

The name, biceps femoris, tells us that this muscle has two heads and lies over the femur.

- **Derivation**
  - biceps: L. *two heads*
  - femoris: L. *refers to the femur*

- **Pronunciation**
  - BY-seps
  - FEM-o-ris

### ATTACHMENTS

- **LONG HEAD:** Ischial Tuberosity
  - and the sacrotuberous ligament
- **SHORT HEAD:** Linea Aspera
  - and the lateral supracondylar line of the femur to the
- **Head of the Fibula**
  - and the lateral tibial condyle

### FUNCTIONS

#### Concentric (Shortening) Mover Actions

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<th>Reverse Mover Actions</th>
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<td>1. Flexes the leg at the knee joint</td>
<td>1. Flexes the thigh at the knee joint</td>
</tr>
<tr>
<td>2. Extends the thigh at the hip joint</td>
<td>2. Posteriorly tilts the pelvis at the hip joint</td>
</tr>
<tr>
<td>3. Laterally rotates the leg at the knee joint</td>
<td>3. Medially rotates the thigh at the knee joint</td>
</tr>
<tr>
<td>4. Laterally rotates the thigh at the hip joint</td>
<td>4. Contralaterally rotates the pelvis at the hip joint</td>
</tr>
<tr>
<td>5. Adducts the thigh at the hip joint</td>
<td>5. Elevates the same-side pelvis at the hip joint</td>
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#### Standard Mover Action Notes

- The biceps femoris crosses the knee joint posteriorly (with its fibers running vertically in the sagittal plane); therefore it flexes the leg at the knee joint. (action 1)
- The long head of the biceps femoris crosses the hip joint posteriorly (with its fibers running vertically in the sagittal plane); therefore it extends the thigh at the hip joint. The short head cannot extend the thigh at the hip joint because it does not cross the hip joint. (action 2)
- The biceps femoris crosses the knee joint laterally from posterior to anterior (with its fibers running somewhat horizontally in the transverse plane) and attaches to the lateral leg. When the biceps femoris pulls at the leg attachment, the attachment is pulled posteriorly, causing the anterior leg to face somewhat laterally. Therefore the biceps femoris laterally rotates the leg at the knee joint. (action 3)
- The long head of the biceps femoris crosses the hip joint laterally, wrapping around the thigh from posteriorly on the pelvis to more anteriorly onto the leg (with its fibers running somewhat horizontally in the transverse plane). (Note: The knee joint can only rotate if it is first flexed.)

### Figure 15-13

Posterior views of the right biceps femoris. A, The long and short heads of the biceps femoris are drawn in. The semitendinosus has been ghosted in. B, The short head of the biceps femoris. The semimembranosus has been ghosted in.
1. The biceps femoris has one line of pull upon the leg and thigh in an oblique plane and therefore creates one motion, which is a combination of flexion and lateral rotation of the leg at the knee joint, and extension, lateral rotation, and adduction of the thigh at the hip joint.

2. Regarding its reverse action pull on the pelvis, the biceps femoris has one line of pull in an oblique plane and therefore creates one motion, which is posterior tilt along with contralateral rotation and same-side elevation of the pelvis.

Eccentric Antagonist Functions
1. Restrains/slows knee joint extension and medial rotation of the leg and lateral rotation of the thigh at the knee joint
2. Restrains/slows flexion, medial rotation, and abduction of the thigh at the hip joint
3. Restrains/slows anterior tilt, ipsilateral rotation, and same-side depression of the pelvis at the hip joint

Isometric Stabilization Functions
1. Stabilizes the thigh and pelvis at the hip joint
2. Stabilizes the knee joint

Additional Notes on Actions
1. All three hamstring muscles (biceps femoris, semitendinosus, and semimembranosus) flex the knee joint.
2. All hamstring musculature (except the short head of the biceps femoris) extends the thigh (and posteriorly tilts the pelvis) at the hip joint.

**INNERVATION**
- The Sciatic Nerve
- The tibial nerve and the common fibular nerve; L5, S1, S2

**ARTERIAL SUPPLY**

Long Head
- The Inferior Gluteal Artery (a branch of the Internal iliac Artery) and perforating branches of the Deep Femoral Artery (a major branch of the Femoral Artery)
- and the Obturator Artery (a branch of the Internal iliac Artery) and branches of the Popliteal Artery (the continuation of the Femoral Artery)

Short Head
- Perforating branches of the Deep Femoral Artery (a major branch of the Femoral Artery)
- and branches of the Popliteal Artery (the continuation of the Femoral Artery)

**PALPATION**
1. With the client prone with the leg partially flexed at the knee joint, place palping hand just distal and slightly lateral to the ischial tuberosity.
2. Resist the client from performing further flexion of the leg at the knee joint and palpate the biceps femoris toward the head of the fibula.

**RELATIONSHIP TO OTHER STRUCTURES**
- The biceps femoris is a lateral hamstring muscle.
- The biceps femoris is superficial in the posterolateral thigh, except proximally where it is deep to the gluteus maximus.
Biceps Femoris (of Hamstring Group)—cont’d

- The proximal attachment of the short head of the biceps femoris begins immediately distal to the femoral attachment of the gluteus maximus.
- All fibers of the short head of the biceps femoris are deep to the long head except distally near the knee, where some of the fibers of the short head are superficial, lateral to the long head of the biceps femoris.
- The biceps femoris is just lateral to the semitendinosus and just medial (and also superficial) to the vastus lateralis.
- The biceps femoris is located within the superficial back line and spiral line myofascial meridians.

MISCELLANEOUS

1. The proximal attachment of the biceps femoris’ long head blends with the proximal attachment of the semitendinosus.
2. Some sources state that the short head of the biceps femoris is not a true hamstring muscle because it does not attach to the ischial tuberosity, does not cross the hip joint, and is not innervated by the tibial nerve branch of the sciatic nerve.