

NeuroKinetic Therapy

*An Innovative
Approach to
Manual Muscle
Testing*

David Weinstock

NeuroKinetic Therapy presents manual muscle testing used with a specific protocol specially designed to stimulate the body-mind complex to resolve injury, stress, and pain. Unlike other therapeutic approaches that treat only symptoms, NeuroKinetic Therapy goes to the source of the problem by reprogramming dysfunctional movement patterns. Written for beginning and experienced manual therapists, this book includes detailed photographs that demonstrate correct positioning accompanied by concise explanations and instructions for assessing and testing muscle function. Organized anatomically, each section introduces the muscles and corresponding tests for the neck, torso, and extremities with labeled anatomical illustrations showing the relationships between the muscles and muscle groups. This book is an essential resource for practitioners seeking to complement their current practice with an innovative approach to treating the underlying causes of pain.

"Among the numerous volumes of so-called therapeutic manuals in the field of neuromuscular assessment and treatment, few truly meet the dual standard of providing skill enhancement while resting on a firm scientific foundation. David Weinstock's *NeuroKinetic Therapy* not only meets this standard but raises it to a new level. Combining anatomical detail with superb illustrations and photos, the book carefully guides the practitioner in learning this subtle but very powerful form of therapy. . . . What a joy it is to move away from repetitive treatment to truly unwind the effects of injury, stress, and poor posture in our patients."

— Steven Katz, DC, Katz Chiropractic, Mill Valley, California

"David Weinstock's book enables both beginning and experienced manual therapists to expand on their assessment skills and to determine their subsequent treatment strategy. This extremely organized book filled with beautiful photos and illustrations helps to guide practitioners through a more specific and meaningful approach to manual muscle testing. Weinstock brings together his incredible breadth of knowledge and experience in neuromuscular reeducation and manual therapy in this well-written, easy-to-follow book."

— Cindy Lewton Dehan, physical therapist, Active Marin Physical Therapy, Larkspur, California

"Finally a manual written in accessible terms with end user results. The photos are clear and concise. Weinstock captures the essence and extreme importance of muscle testing for any physical practice. I have no doubt that this book will become a bible for all types of movement core therapists and educational programs. I have added it to the list of required reading for all students enrolled in our pilates certification programs."

— Stacy Allegro, director, Fit First Pilates, Corte Madera, California

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Praise for *NeuroKinetic Therapy*

"*NeuroKinetic Therapy* is one of the best manual therapy instructional manuals available. The layout and photos make it easy to follow and understand. It is a great tool and will be useful in my practice, complementing my work with chiropractic, Active Release Techniques, and Egoscue exercise."

— Bruce Rizzo, DC, ART, My Chiro Care,
Berkeley, California

"NeuroKinetic Therapy is an invaluable tool that will greatly enhance a personal trainer's repertoire and level of expertise. Clients often come to trainers with old injuries that have subsequently created compensatory patterns or muscular imbalances. *NeuroKinetic Therapy* provides detailed instructions for helping clients regain the muscular control and balance to perform to their potential. Easy to follow and understand, the book shows the trainer how to accurately and effectively assess and test clients. The book's photographs allow the trainer to know precisely where to place pressure and how the client needs to be positioned so that the muscle test is effective. This manual is a great complement to any trainer's library."

— David Phillips, CES, NASM certified personal trainer,
Fit Bridge, Mill Valley, California

"Muscle testing is used in many disciplines but there has not been consistency in how it is performed. In his new book *NeuroKinetic Therapy*, David Weinstock clearly demonstrates this technique in a succinct and thorough manner. He covers testing of the individual muscles with clear images, including their anatomical origin, insertion, and actions. This book should be a part of any soft tissue specialist's library."

— Douglas Kyle, DC, DABCO, ART, Marin Spine and Sport,
Corte Madera, California

“NeuroKinetic Therapy clearly and thoroughly outlines muscle testing techniques along with related anatomy, but it is its use with the NeuroKinetic Therapy protocol that demonstrates how the approach is a step up from massage and strengthening models more traditionally applied. I defer to David for those difficult-to-unravel pain patterns, both professionally and personally, and always with success.”

— Caryl Sircus, physical therapist, Aquatic Therapy Associates,
San Rafael, California

“Both concise and clear, this book breathes rehabilitation and therapeutic alignment. For a yoga instructor it provides a deeper skill set and knowledgeable platform from which to work and teach. It can greatly assist your students’ structural integrity as well as provide the capacity to heal any trauma that may be restricting the full range of motion or causing pain. This book is a treasure!”

— James Higgins, yoga instructor, Yoga Studio,
Mill Valley, California

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Manual Muscle Testing*

David Weinstock



North Atlantic Books
Berkeley, California

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*To my teachers,
colleagues, students, and clients
who have inspired the improvisations
that comprise this work.*



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Preface

NeuroKinetic Therapy (NKT) was developed in part due to my frustration with the impermanent results obtained by my clients. I found I was treating symptoms, not causes. Although my clients loved my work and got relief, some of them came back virtually the same. Clearly something was missing. That component turned out to be motor control theory.

I incorporated manual muscle testing into my work in the early 1980s. Jocelyn Olivier later introduced me to her concept of muscle compensation. By testing and retesting muscles in specific relation to each other, I learned that muscles become chronically tight to brace for weaker or inhibited muscles. Now I was getting closer to understanding the cause of heretofore unresolved conditions.

A student suggested a book entitled *The Neural Basis of Motor Control* by Vernon Brooks. I learned about the hierarchy of motor control. Here's an example that demonstrates this process. Let's say I want to get a cookie (albeit healthy) off the top shelf. Before my hand can reach up there and grasp it, many things have to happen in a chain of command. First the limbic system demands that I "fill my needs." Next the cerebral cortex selects a strategy: "Take this route." Then the motor control center (MCC), where all movement patterns are coordinated, says, "Do it this way now." That message is sent to the spine, whose command is "Do it!" Finally, all of this neural information arrives at the muscles, where "doing it" actually occurs. The brain learns from failure. When a client cannot perform a manual muscle test, the MCC "lights up" and becomes available for new learning. I then realized that the cause of the unresolved conditions lay in the MCC.

NKT therefore is a technique that not only recognizes the importance of motor control theory, it utilizes it to make significant changes in movement patterns. The brain has to relearn how to perform a

functional movement pattern and rid itself of a dysfunctional one. In the last twenty-plus years my colleagues and I have been able to help people who were told “not to expect too much.” My days are filled with gratifying and rewarding interactions. The “missing link” was found and put to good use.

NKT is constantly growing and changing due to two circumstances. One, the therapist has to improvise, so new techniques are developed. The second is that each therapist brings his or her expertise to the table. Thus orthopedic testing and different release techniques are now integrated into the process. Put this wonderful adjunct in your toolkit and join us on a constantly evolving journey.

Introduction

This book is intended as a resource for practitioners who already use muscle testing to assess structural issues, and for those wanting to learn muscle testing. The images are presented in a way that allows the tester to understand his or her positioning as well as that of the subject in order to get an accurate “read” from the muscle test. For those who use NKT (or similar modalities), there is detailed information about the muscle and how it acts in relation to other muscles.

Who Can Use This Manual?

1. Massage therapists
2. Physical therapists
3. Pilates trainers
4. Personal trainers
5. Chiropractors (especially with ART, Active Release Technique)

Why Use This Manual?

1. Precise photographs and comprehensible descriptions allow for accurate muscle testing.
2. Muscle testing provides information on whether a muscle or function is weak or strong.
3. Knowing that a muscle or function is weak, one can relate it to another (or more than one) that is too strong, tight, or painful.
4. Familiarity with the NKT protocol allows the practitioner to address many different patterns of compensation.

Theoretical Basis

NKT is founded on Motor Control Theory (*The Neural Basis of Motor Control* by Vernon Brooks). The Motor Control Center (MCC) located in the cerebellum receives information from the limbic system (“fill my

needs”) and then the cerebral cortex (“take this route”) before passing the information to the spine (“do it”) and the musculoskeletal system (“doing it”).

The MCC is stimulated by a muscle or function failure. A good example of this is when a baby is learning to stand. Many unsuccessful attempts are made before standing upright is achieved. With each failure the MCC is “lit up” for new learning. The MCC organizes all body movement and patterns. It can learn new successful routines (e.g., gymnastics), or in response to trauma it can create dysfunctional patterns. With each attempt some aspect of success is achieved and assimilated. Finally the baby learns to stand. The successful information is now programmed into the MCC. Conversely, when one is injured, dysfunctional patterns get stored. For example, in whiplash the neck extensor muscles can become extremely tight and painful. Massage, stretching, etc., may have little or no effect.

Why? The MCC has now stored in its memory the fact that the neck flexors are weak and vulnerable. How is it going to keep the head upright? It chooses to keep the neck extensors tight to support the weight of the head. Until the pattern is cleared using the NKT protocol (or something similar), the neck extensors will remain locked.

NKT complements other modalities—whatever techniques you currently employ can be integrated into the protocol. It’s a great skill to have in your repertoire. Having more information about how to assess and treat specific conditions makes you a more effective practitioner. Familiarity with NKT can be a great foundation for achieving mastery in your profession.

Many compensation patterns can develop through injury and time. This manual includes the three most commonly treated relationships:

1. **Core:** *spinal muscles to the extremities*
2. **Antagonist:** *muscles working in opposite pairs*
3. **Synergist:** *muscles that work together to perform a function, or muscles that work in sequence with each other*

At the end of each chapter is a functional anatomy illustration entitled “Muscle Group Actions.” The Core, Antagonist, and Synergist relationships involve muscles and functions that can be referenced here.

As you will see, depending on your skill level, this manual can be used to resolve simple to very complex conditions. Of course, training in NKT is highly recommended.

How to Use This Manual

This manual has been organized anatomically, with chapters showing the muscles and actions for the neck, torso, and extremities. There is a logical progression from core to distal muscles. An anatomical diagram is provided at the end of each chapter. Knowing how muscles are related to each other is key to utilizing NKT properly.

Each page is titled according to the muscle or function it presents. The images show the optimal position of the client and practitioner for testing purposes. **Particular care has been taken with positioning because any strain or imbalance in either participant can lead to an inaccurate “reading” of the test results.**

The captions accompanying the images describe the most ergonomic and precise way to perform a test. The position of the arrow shows the direction of the applied “force” (resistance) of the therapist. The client “resists” that pressure in the opposite direction.

Three kinds of pressure are used in NKT testing:

1. Light—minimal force applied for one to two seconds to check the availability of the neural pathway (does it respond?).
2. Medium—a somewhat heavier force is applied for one to two seconds to ascertain the strength of the muscle.
3. Heavy—a firm pressure is used for five to ten seconds to test for stamina.

It is highly recommended that the therapist start with a “light” pressure and then continue with “medium” and “heavy” as progress is made. When testing, asking the client to “meet my pressure” produces

the best results. The word “resist” in relation to the client means to “*meet my pressure.*”

For each muscle there is a description of its attachments. I use the word “attachment” instead of “origin” and “insertion” because the latter two can reverse themselves depending on how the muscle is used. The first attachment is capitalized and listed, followed by “and”, and then the second one is capitalized and delineated.

The information contained in the box lists the three most commonly treated relationships: “Core,” “Antagonist,” and “Synergist.”

Core refers to the bracing of the spinal muscles when the extremities are weak (e.g., upper thoracic erectors to middle trapezius).

Antagonist refers to the bracing of muscles or functions when their opposites are weak (e.g., biceps to triceps).

Synergist refers to the bracing of a muscle that helps another weaker muscle perform a function (e.g., iliacus to psoas in hip flexion).

“Synergist” also refers to muscles working together to perform a more complex movement such as picking up a glass of water and drinking it. Any muscle in that series could brace for a weaker one (e.g., brachioradialis to anterior deltoid). The muscles and functions listed in the box are also related to one another in the anatomy reference (e.g., psoas as one of the “hip flexors”).

NeuroKinetic Therapy Protocol

When a client presents with a tight, painful, or injured area, focusing on that may not locate the cause of the problem. Rather than release the tight muscles, the NKT protocol has you assess the muscles in the affected area. This will help you not only pinpoint the cause but also treat it successfully.

Let’s use a typical whiplash case to demonstrate. The client has very tight and painful neck extensors.

Step 1: First test the neck extensors—they test strong (“strong” refers to responsive; “weak” refers to unresponsive).

Step 2: Then test the neck flexors—they are weak. **When a muscle tests weak, the Motor Control Center (MCC) is stimulated.** You now have thirty to sixty seconds to release the tight muscles. You can use whatever release technique you know to achieve this.

Step 3: Finally, retest the neck flexors. If they test strong, you have successfully stimulated and reprogrammed the MCC.

In other words, the MCC can now send a message to the neck flexors on a neural pathway without any inhibition from the neck extensors. If the neck flexors test weak a second time, redo your release, perhaps on different muscles in that area. If that doesn’t work, you may have to use the muscles listed in the “Synergist” section. This is the joy and satisfaction of the NKT protocol. It allows you to be a good detective.

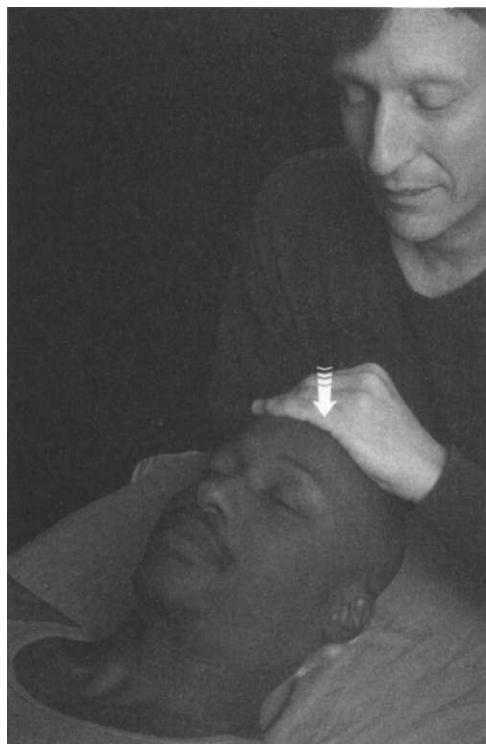
Once you have unraveled the dysfunctional relationships, you can assign “homework” for the client. In the whiplash example, one can stretch the neck extensors first and then strengthen the neck flexors (mimics the muscle test). Have your client demonstrate this for you *before* leaving your office. Make sure the neck extensors are *not* being engaged. Use enough resistance to feel *only* the neck flexors working. The assignment needs to be done twice a day so that the new neural pathway is “burned in” to the MCC. Remember, this is a matter of activating a neural pathway that has been unavailable for some time. Doing this slowly and precisely will yield better results. Fatiguing the muscle will recreate the old dysfunctional pattern.

As complex as the body is, there are many relationships not even mentioned in this manual. Training in this technique is highly recommended. It is my hope that with the information provided here, you will incorporate NKT into your practice to help your clients achieve results they never thought possible.

I. Neck

NECK FLEXION

Supine and Prone

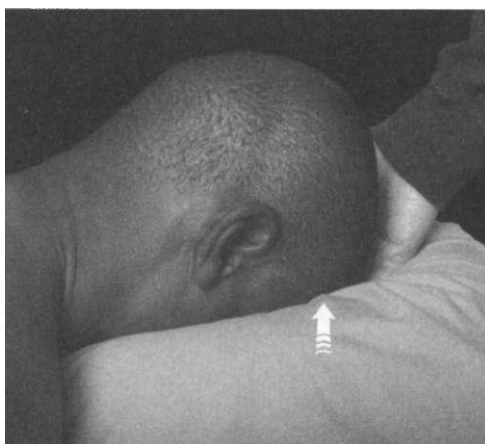


Therapist lifts and supports the head 3–4 inches off the table. If client can hold his or her head up, apply *light* resistance downward on the forehead while client resists up. Watch for breath holding, thrusting the chin up, or trying to curl the abdomen to complete the movement.

Core: *Cervical*

Antagonist: *Neck extensors*

Synergist: *SCMs, longus colli, abdominals, hip flexors*



Gently lift the head while the client presses down.

UNILATERAL STERNO-CLEIDOMASTOID (SCM)

SCM Attachment: Top of sternum, medial clavicle, and Mastoid process

Action: Flexion and rotation of the neck

Core: Cervical

Antagonist: Neck extensors

Synergist: Abdominals, psoas, hip flexors



This test is the same as the bilateral SCM test, with the client's head rotated 45° to one side. Pressure is applied on side of forehead above the eyebrow. *Be careful not to press too hard!*

LONGUS COLLI

Longus Colli Attachment: C1 and C2 anterior and C3–C7 anterior

Action: Flexion of the neck

Core: Cervical

Antagonist: Neck extensors

Synergist: Abdominals, psoas, hip flexors



Support the client's head an inch or two off the table with one hand. Ask the client to hold a forward nod, chin tucked, while you gently try to tip the forehead back, as if to undo the nod. Watch out for the client trying to lift the chin to resist (uses SCMs not longus colli).

SCALENE, MEDIAL

Attachment: C3–C7 and Anterior ribs
#s 1–2

Action: Neck flexion and lateral flexion

Core: *Cervical*

Antagonist: *Neck extensors, levator scapula*

Synergist: *Abdominals, psoas, deltoids, triceps, brachioradialis, wrist extensors, thumb extensors*



Resist at temple while client aims head toward shoulder.

SCALENE, ANTERIOR

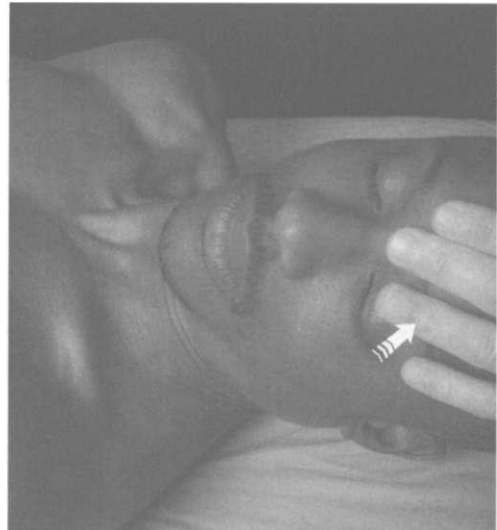
Attachment: Same as medial (above)

Action: Neck flexion and lateral flexion

Core: *Cervical*

Antagonist: *Neck extensors, levator scapula*

Synergist: *Abdominals, psoas, deltoids, triceps, brachioradialis, wrist extensors, thumb extensors*



Resist above eyebrow while client aims head toward shoulder.

BILATERAL NECK EXTENSION

Supine and Prone

Core: *Cervical*

Antagonist: *Neck flexors*

Synergist: *Thoracic erectors, lumbar erectors, gluteus maximus bilateral*



Raise client's head a few inches off the table and resist neck extension. This tests the upper neck extensors.



With client's head flat on table, resist neck extension. This tests the lower neck extensors.



Resist neck extension (shows full length of neck extensors). If head is lifted off table, this tests thoracic extension.

UNILATERAL NECK EXTENSION

Supine and Prone



Rotate head fully and resist extension. Prone position shows the full length of back extensors unilaterally.

Core: *Cervical*

Antagonist: *SCM*

Synergist: *Thoracic erectors, lumbar erectors, gluteus maximus unilateral*



ROTATION OF THE CERVICAL SPINE

Supine

Core: *Cervical*

Antagonist: *Opposite rotation*

Synergist: *Opposite thoracic, same-side lumbar rotation*



Resist above ear while client rotates head.

TRAPEZIUS, UPPER

Supine and Prone

Attachments: Occiput, C1–7 and Lateral clavicle, acromion

Action: Elevation and upward rotation of the scapula

Core: *Upper thoracic, cervical*

Antagonist: *Latissimus dorsi, lower trapezius*

Synergist: *Obliques, quadratus lumborum, gluteus medius, tensor fascia latae*



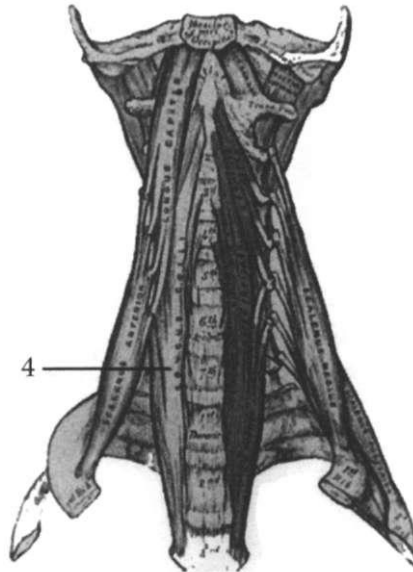
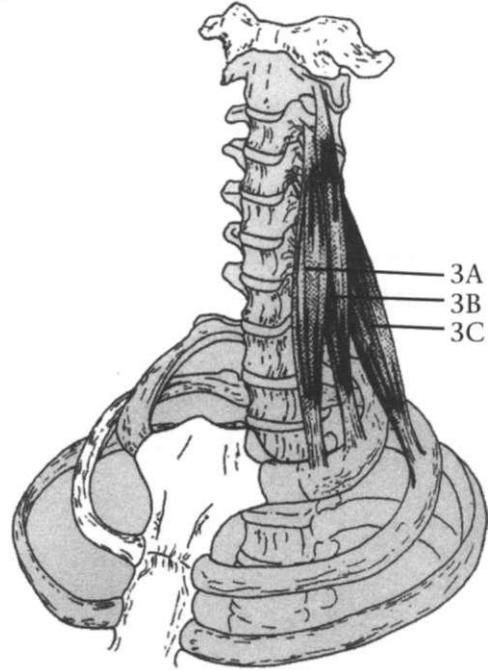
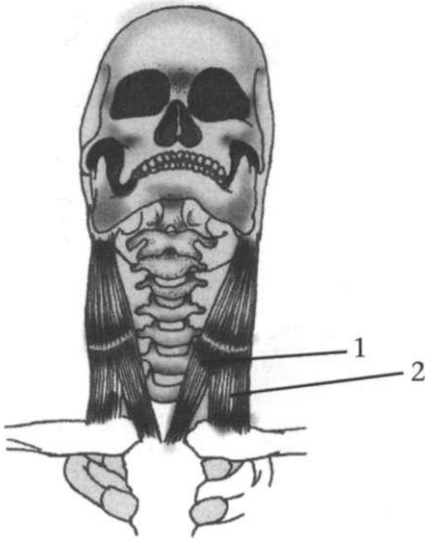
Head straight. Resist lateral flexion of neck above ear while resisting shoulder elevation.



■ Muscle Group Actions of the Neck

NECK FLEXORS

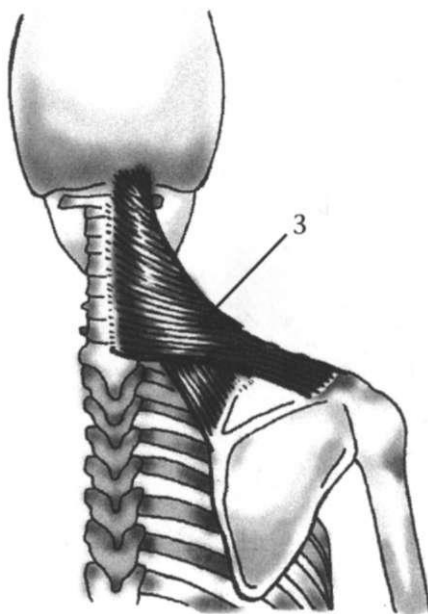
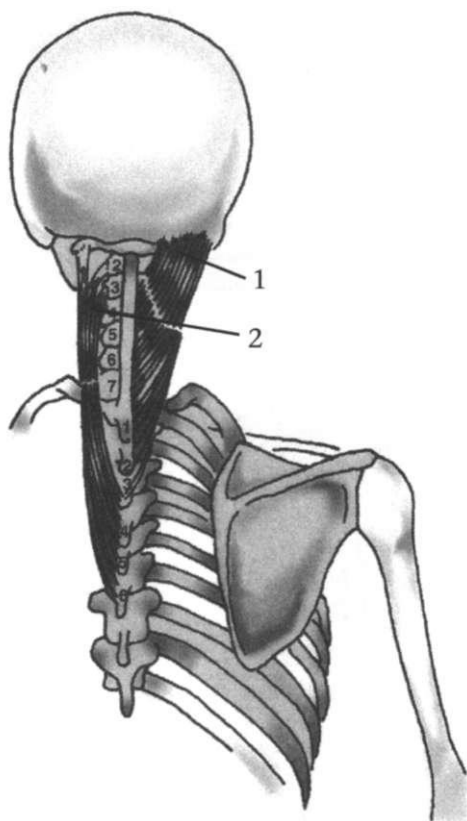
1. SCM—Sternal attachment
2. SCM—Clavicular attachment
3. Scalenes—A. Anterior; B. Medial;
C. Posterior
4. Longus Colli



NECK EXTENSORS

1. Splenius Capitus
2. Splenius Cervicis
3. Upper Trapezius

Erector Spinae—see Torso Extensors in the anatomy reference (“Muscle Group Actions”) at the end of Chapter III.



II. Upper Extremities

TRAPEZIUS, MIDDLE

Supine and Prone

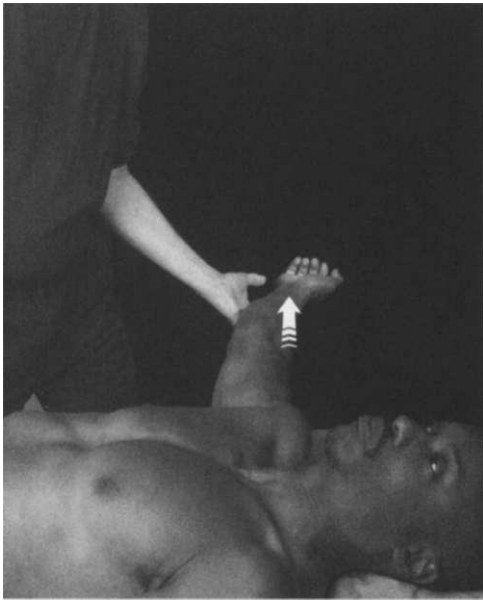
Attachment: C7 to T5 and Spine of scapula

Action: Retraction of scapula

Core: Thoracic

Antagonist: Pectoralis clavicular, pectoralis minor, serratus anterior

Synergist: Rhomboid, posterior deltoid, triceps, wrist extensors



Humerus is abducted 90°, elbow locked. Place hand on posterior forearm superior to the wrist and resist downward movement.



Humerus is abducted 90°, elbow locked. Place your hand on anterior forearm superior to the wrist to support client's arm. Place other hand on posterior forearm above the wrist and resist upward movement gently!

TRAPEZIUS, LOWER

Supine and Prone

Attachment: T5–I2 and Root of spine
of scapula

Action: Depression and upward rotation
of scapula

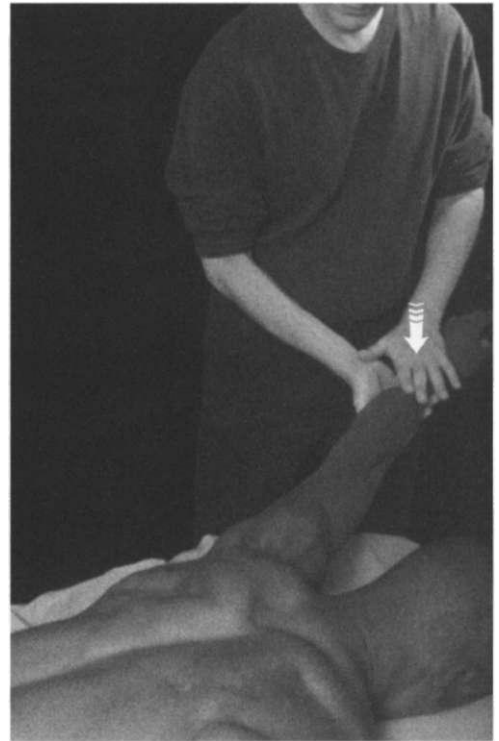
Core: *Thoracic*

Antagonist: *Pectoralis sternal,
upper trapezius, levator scapula,
rhomboid, pectoralis minor*

Synergist: *Wrist extensors, triceps,
posterior deltoid, latissimus dorsi,
teres minor, infraspinatus*



Humerus is abducted 135° with elbow locked. Place hand on posterior forearm superior to the wrist. Resist downward movement.



Humerus is abducted 135°, elbow locked. Place one hand on anterior forearm superior to the wrist to support the arm, and the other on the posterior forearm superior to the wrist. Resist upward movement gently!

LATISSIMUS DORSI

Supine and Prone

Straight Arm

Attachment: Sacrum, iliac crest, T7–L2, inferior angle of scapula and Bicipital groove

Action: Extension, medial rotation, and adduction of humerus

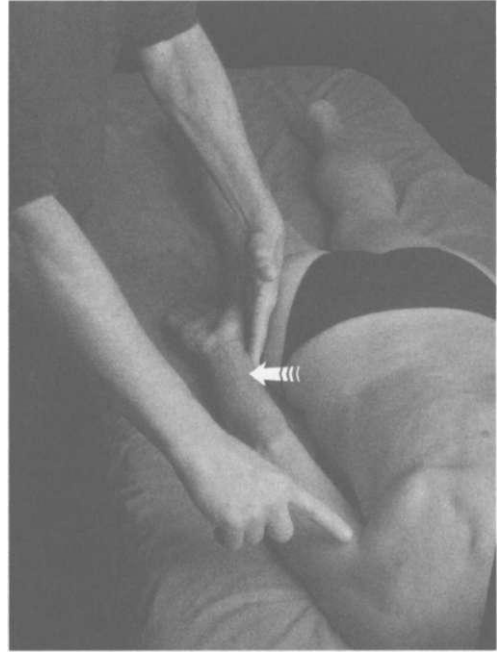
Core: Thoracic, lumbar

Antagonist: Abductors of humerus, lateral rotators of humerus, flexors of humerus

Synergist: Adductors of humerus, medial rotators of humerus, extensors of humerus



Humerus is adducted and medially rotated against body, elbow locked. Place hand on posterior forearm superior to the wrist. Resist adduction.



LATISSIMUS DORSI

Bent Arm

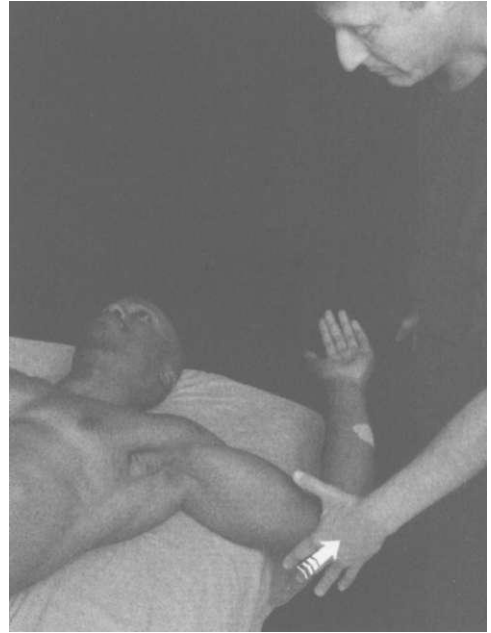
Attachment: Inferior angle of scapula
and Bicipital groove

Action: Depression of scapula via the
humerus

Core: Thoracic

*Antagonist: Upper trapezius,
levator scapula*

*Synergist: Teres major, lower
trapezius, teres minor*



Humerus is abducted 90°, elbow bent 90°, shoulder externally rotated. Resist adduction at the elbow.



Latissimus dorsi detail

TERES MAJOR

Supine and Prone

Attachment: Inferior angle of scapula and
Medial edge of bicipital groove of humerus

Action: Extension, medial rotation, and
adduction of humerus

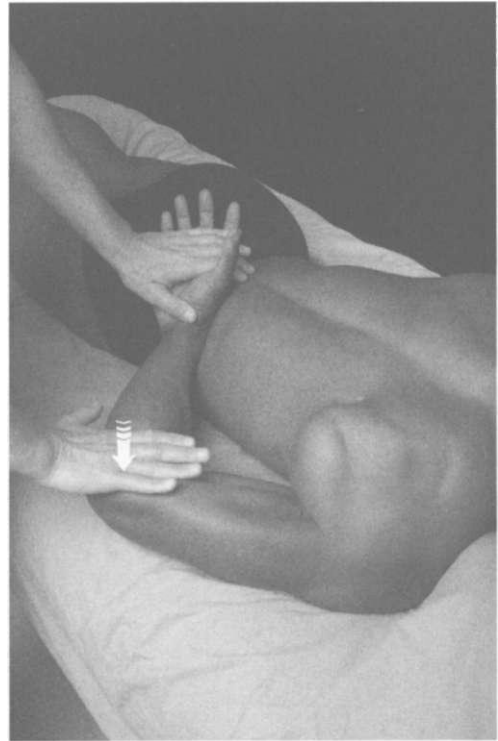
Core: *Thoracic*

Antagonist: *Humeral flexors,
lateral rotators, and abductors*

Synergist: *Latissimus dorsi and
humeral extensors, medial rotators,
and adductors*



Bend elbow and place back of client's hand under her back at waistline. Place your hand on the anterior side of the elbow. Resist downward movement.



Elbow is bent with back of hand on lower back. Place one hand on elbow and the other on palm of hand. Resist upward movement of elbow.

LEVATOR SCAPULA

Supine and Prone

Attachment: C1–4 and Medial, superior angle of scapula

Action: Elevation and downward rotation of scapula

Core: Upper thoracic, cervical

Antagonist: Scalenes, latissimus dorsi, lower trapezius

Synergist: Posterior deltoid, triceps, quadratus lumborum, gluteus maximus



Client rotates head slightly to the side. Resist lateral flexion of the neck above the ear with one hand, and resist shoulder elevation with the other.

RHOMBOIDS

Supine and Prone

Attachment: C7–T5 and Vertebral border of scapula

Action: Retraction and downward rotation of scapula

Core: *Cervical, thoracic*

Antagonist: *Pectoralis minor, serratus anterior*

Synergist: *Middle trapezius, latissimus dorsi, quadratus lumborum*



Humerus abducted 45°, elbow bent 90°, palm facing in. Resist adduction at elbow.



Elbow bent and slightly abducted. Resist adduction at elbow.

DELTOID, ANTERIOR

Supine and Prone

Attachment: Lateral third of clavicle and
Deltoid tuberosity

Action: Flexion, horizontal adduction,
medial rotation of humerus

Core: Thoracic

Antagonist: *Posterior deltoid;
extensors, horizontal abductors, and
lateral rotators of humerus*

Synergist: *Wrist extensors, biceps,
coracobrachialis, pectoralis major
and minor, subscapularis,
latissimus dorsi*



Deltoid group detail



Abduct humerus slightly. Place hand on posterior forearm superior to the wrist. Resist humeral flexion.



Humerus abducted 90° with elbow bent 90°. Resist horizontal adduction with hand on the inferior part of the bicep and other hand grasping the client's hand.



Client's elbow is bent 90°. Place your hand on the underside of the arm superior to the elbow. Resist downward movement of arm.

****Top hand is placed above elbow for stability.**

DELTOID, MIDDLE

Supine and Prone

Attachment: Lateral acromion and
Deltoid tuberosity

Action: Abduction of humerus to 90°

Core: Thoracic

Antagonist: Humeral adductors

Synergist: Humeral abductors



Humerus is abducted 90° with elbow bent 90°. Resist abduction with hand superior to client's elbow and opposite hand holding client's wrist.



Client's elbow is bent 90°. Place your hand superior to the elbow and resist abduction.

DELTOID, POSTERIOR

Supine and Prone

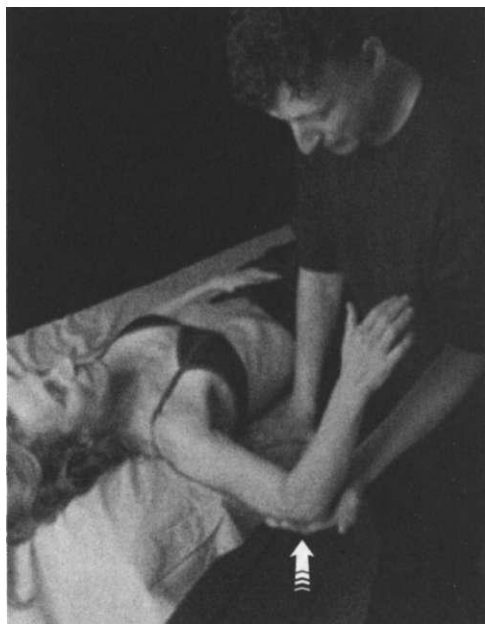
Attachment: Lateral acromion and Deltoid tuberosity

Action: Extension, horizontal abduction, and lateral rotation of humerus

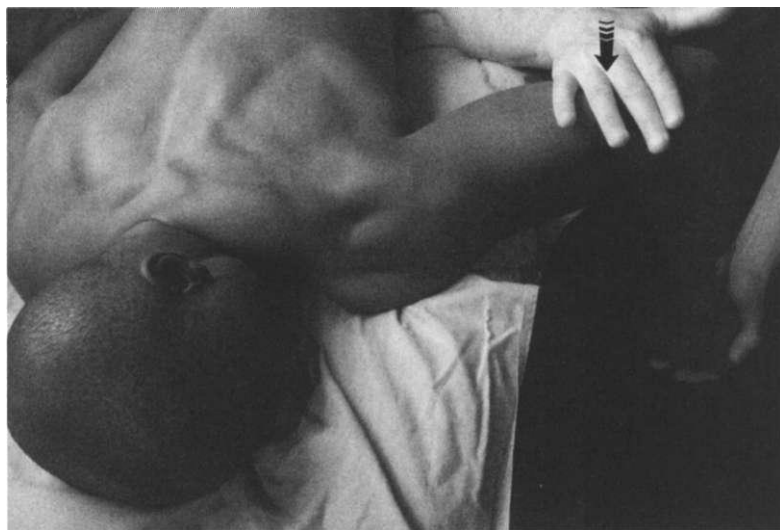
Core: *Thoracic*

Antagonist: *Anterior deltoid*

Synergist: *Triceps, upper trapezius*



The client's elbow is bent 90°. Place your hand on upper arm superior to the elbow. Resist downward movement.



Elbow bent, humerus abducted 90°. Support client's hand while placing your other hand superior to his elbow. Resist upward movement.

CORACOBRACHIALIS

Supine

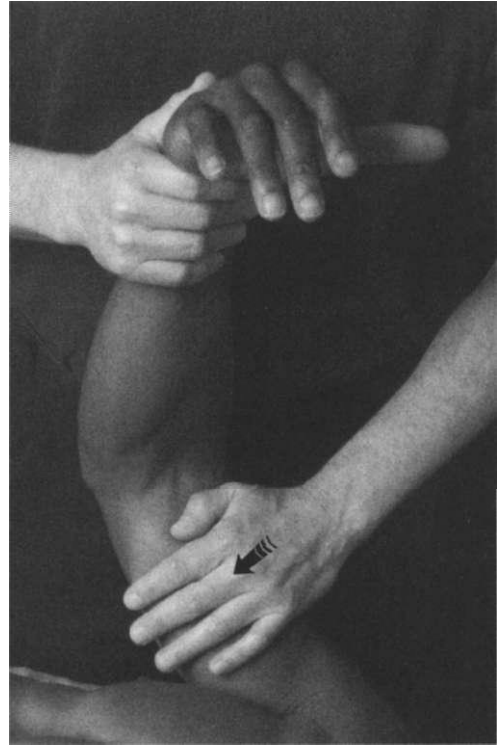
Attachment: Coracoid process and
Middle third of medial surface
of humeral shaft

Action: Flexion and adduction
of humerus

Core: *Thoracic*

Antagonist: *Humeral extensors
and abductors*

Synergist: *Biceps, anterior deltoid,
pectoralis major, humeral adductors*



Humerus is abducted slightly, elbow bent 90°. Place hand on arm superior to the elbow while grasping the client's hand. Resist flexion.

TERES MINOR

Supine and Prone

Attachment: Upper axillary border of scapula and Greater tubercle of humerus

Action: Lateral rotation of humerus

Core: *Thoracic*

Antagonist: *Subscapularis*

Synergist: *Posterior deltoid, triceps, infraspinatus, latissimus dorsi, wrist extensors*



Elbow is bent 90° and humerus abducted 45°. Resist lateral rotation with your hand superior to the client's wrist while stabilizing the opposite side of his elbow.



INFRASPINATUS

Supine and Prone

Attachment: Infraspinatus fossa of scapula
and Greater tubercle of humerus

Action: Lateral rotation of humerus

Core: Thoracic

Antagonist: Subscapularis

*Synergist: Posterior deltoid, triceps,
teres minor, latissimus dorsi, wrist
extensors*



Elbow is bent 90°. Humerus also abducted 90°. Resist lateral rotation with your hand superior to the client's wrist while stabilizing opposite side of elbow.



SUPRASPINATUS

Supine and Prone

Attachments: Supraspinous fossa of scapula and Greater tubercle of humerus

Action: Abduction of humerus

Core: *Thoracic*

Antagonist: *Humeral adductors*

Synergist: *Middle deltoid, wrist extensors, and humeral abductors*



Humerus is abducted 10-15° and lifted slightly off the table. Resist abduction superior to the wrist.



Arm at side, elbow locked. Resist first 15° of abduction.

SUBSCAPULARIS

Supine and Prone

Attachment: Subscapular fossa of scapula
and Lesser tubercle of humerus

Action: Medial rotation of humerus

Core: Thoracic

Antagonist: *Infraspinatus, teres minor, lateral rotators of humerus*

Synergist: *Wrist flexors, medial rotators of humerus*



Humerus is abducted between 45 and 90°. Resist medial rotation with hand superior to the client's wrist while stabilizing opposite side of elbow.



PECTORALIS MAJOR CLAVICULAR

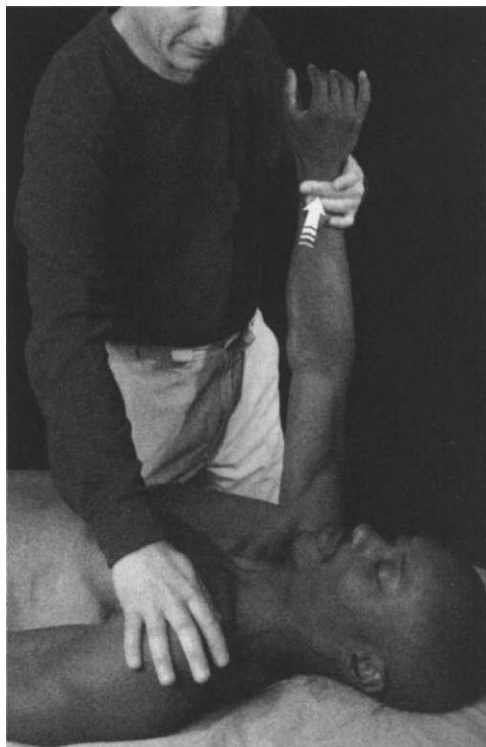
Supine and Prone

Attachment: Medial half of clavicle and
Bicipital groove

Core: *Thoracic*

Antagonist: *Extensors, abductors,
horizontal abductors, and lateral
rotators of the humerus*

Synergist: *Flexors, adductors,
horizontal adductors, and medial
rotators of the humerus*



Client's palm is facing you. Aim the back of his hand toward the opposite shoulder. Resist at wrist.



Pectoralis Major Clavicular detail



Client's palm is facing the floor. Resist downward movement at the wrist.

PECTORALIS MAJOR STERNAL

Supine and Prone

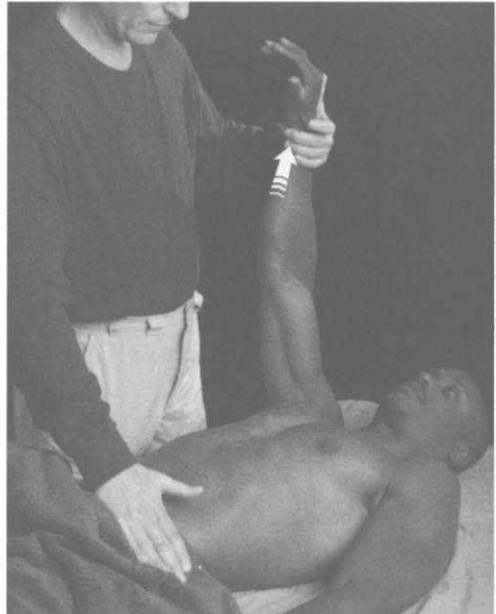
Attachment: Sternal cartilage of ribs 1–6
and Bicipital groove

Action: Adduction, horizontal adduction,
medial rotation of humerus, extension
of humerus from flexed position

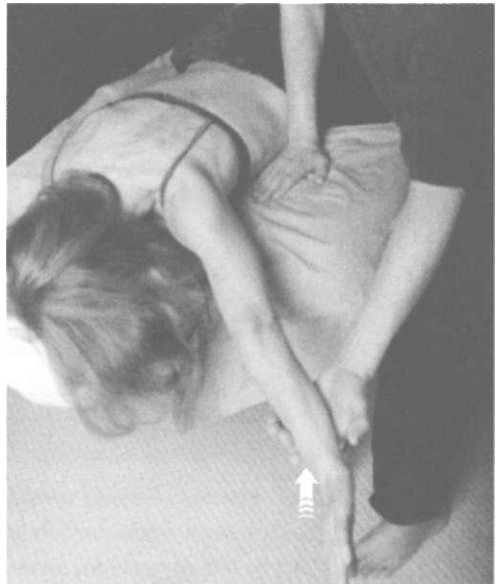
Core: *Thoracic*

Antagonist: *Lower and middle
trapezius, rhomboids, middle
deltoid, posterior deltoid*

Synergist: *Opposite internal
oblique, biceps, latissimus dorsi*



Client aims thumb at opposite hip with elbow locked. Traction arm slightly. Stabilize opposite hip. Resist at wrist.



Arm abducted 135°. Place hand superior to the wrist. Resist downward movement.



Pectoralis Major Sternal detail

PECTORALIS MINOR

Supine

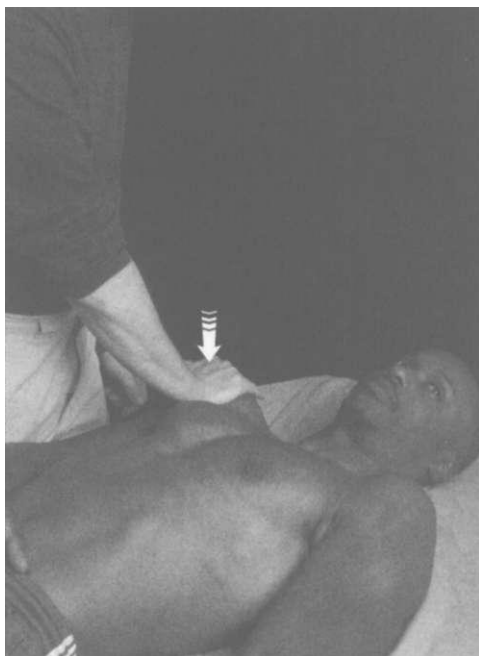
Attachment: Ribs 3–5 and Coracoid process

Action: Protraction, depression, and downward rotation of scapula

Core: Thoracic

Antagonist: Retractors, elevators, and upward rotators of scapula

Synergist: Opposite hip flexors protractors, depressors, and downward rotators of scapula



Client lifts shoulder off table. Resist protraction over the ball of the shoulder joint.

Functional Push-Up Test

Core: Thoracic

Antagonist: Rhomboid and Middle trapezius

Synergist: Pectoralis major and minor, biceps, anterior deltoid, wrist extensors and flexors



Humerus abducted 90°, elbow bent. Place your hand under client's fist (or open palm). Resist client's downward movement. This tests the pectoralis minor and pectoralis major.

SERRATUS ANTERIOR

Supine

Attachment: Outer surface of upper eight ribs and Anterior surface of vertebral border of scapula

Action: Protraction and upward rotation of scapula; stabilizes scapula versus chest wall

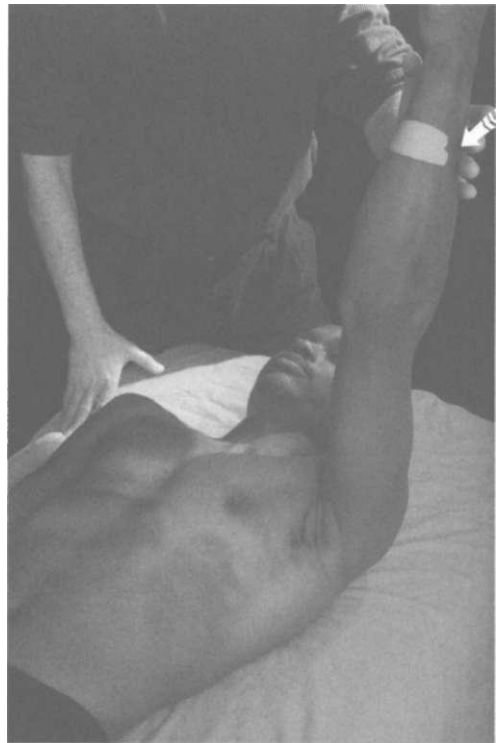
Core: Thoracic

Antagonist: Rhomboids, middle trapezius, downward rotators of scapula

Synergist: Upward rotators of scapula, protractors of scapula



Upper fibers—Humerus flexed 90° and slightly abducted, elbow locked. Resist caudal movement superior to the wrist.



Lower fibers—Humerus flexed 90° and slightly abducted, elbow locked. Resist cephalad movement superior to the wrist.

BICEPS, LONG HEAD

Supine and Prone

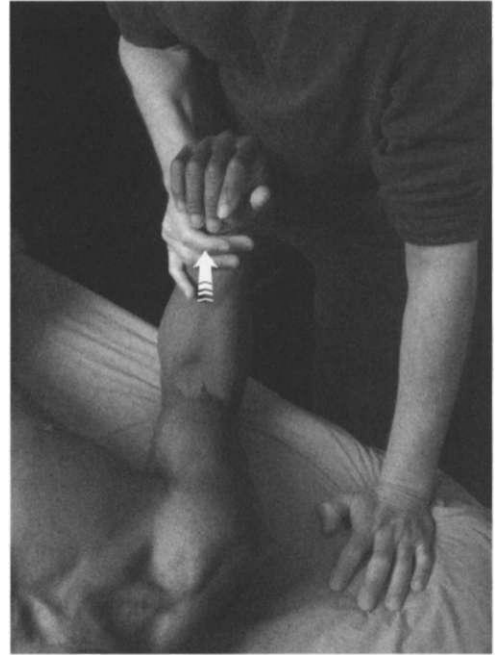
Attachment: Supraglenoid tubercle of scapula and Tuberosity of radius

Action: Flexion of humerus, supination of forearm, abduction of humerus

Core: *Thoracic*

Antagonist: *Triceps, pronator teres, humeral adductors*

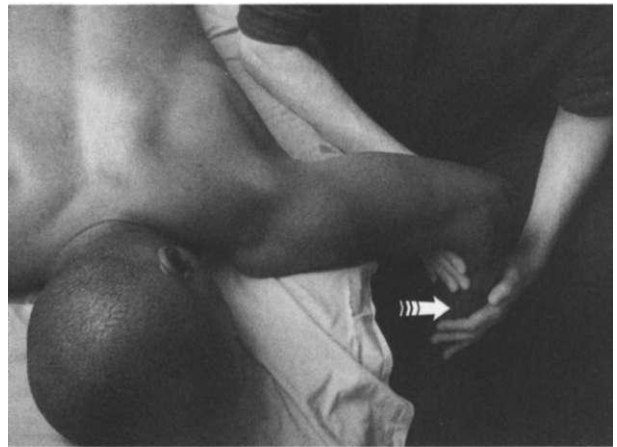
Synergist: *Anterior deltoid, middle deltoid, pectoralis major, supraspinatus, supinator*



Humerus abducted 45°. Resist elbow flexion superior to the wrist.



Biceps detail



Client's elbow is bent 90°. Grasp forearm superior to the elbow. Resist movement of hand to shoulder.

BICEPS, SHORT HEAD

Supine

Attachment: Coracoid process and
Tuberosity of radius

Action: Flexion of humerus, flexion of
elbow, supination of forearm, adduction
of humerus

Core: Thoracic

*Antagonist: Triceps, extensors of
humerus, abductors of humerus,
pronator teres*

*Synergist: Coracobrachialis,
pectoralis major and minor, anterior
deltoid, supinator*



Humerus adducted, elbow bent 90°. Resist
elbow flexion superior to the wrist.

BRACHIALIS

Supine

Attachment: Lower half of anterior shaft
of humerus and Tuberosity of ulna,
coronoid process of ulna

Action: Flexion of elbow



Humerus abducted, elbow bent 90°, thumb
facing client's head. Resist flexion superior to
the wrist.

TRICEPS, LONG HEAD

Supine and Prone

Attachment: Infraglenoid tubercle of scapula and Olecranon

Action: Extension of humerus, extension of elbow

Core: Thoracic

Antagonist: Humeral flexors, elbow flexors

Synergist: Humeral extensors, elbow extensors



Humerus adducted, palm up, elbow locked. Resist extension with hand superior to the client's wrist.



Client's arm is straight at her side. Lift arm slightly off the table. Place your hand on the client's forearm superior to the wrist. Resist upward movement.

TRICEPS, MEDIAL

Supine

Attachment: Posterior humerus and Olecranon

Action: Extension of elbow

Core: Thoracic

Antagonist: Biceps, brachialis

Synergist: Posterior deltoid, latissimus dorsi, teres minor, infraspinatus



Humerus is slightly abducted with elbow bent 90°. Resist extension with hand superior to the wrist.

TRICEPS, LATERAL

Supine and Prone

Attachment: Posterior humerus and
Olecranon

Action: Extension of elbow

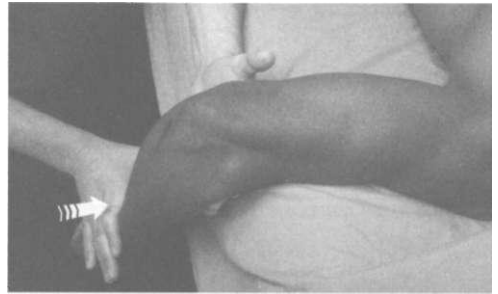
Core: Thoracic

*Antagonist: Long head of biceps,
brachialis*

*Synergist: Posterior deltoid,
latissimus dorsi, teres minor,
infraspinatus*



Humerus abducted with elbow bent 90°. Resist extension with hand superior to the wrist.



BRACHIORADIALIS

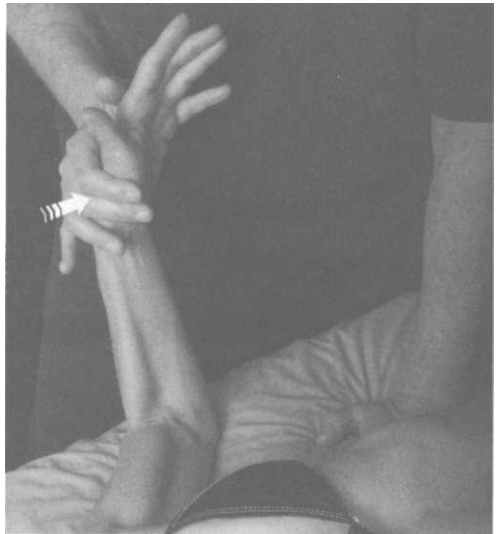
Attachment: Lateral, distal humerus and
Styloid process of radius

Action: Flexion of elbow in neutral position

Core: Thoracic

Antagonist: Triceps

*Synergist: Extensor pollicis longus,
extensor carpi radialis, biceps,
brachialis, anterior deltoid, upper
trapezius, scalenes*



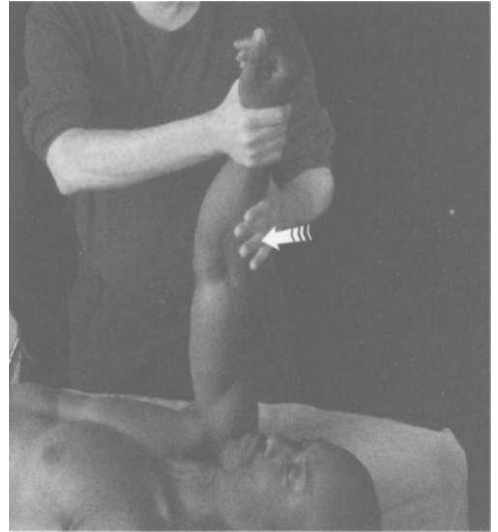
Arm abducted 45° with elbow bent 90°. Resist elbow flexion at base of thumb.

FLEXION OF HUMERUS

Core: Thoracic

Antagonist: Humeral extensors

Synergist: Humeral flexors



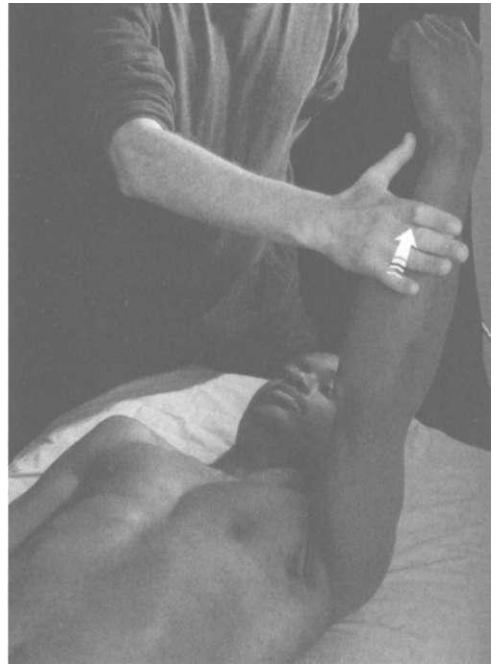
Humerus flexed 90°, elbow locked. Resist flexion inferior to the elbow while grasping wrist.

EXTENSION OF HUMERUS

Core: Thoracic

Antagonist: Humeral flexors

Synergist: Humeral extensors



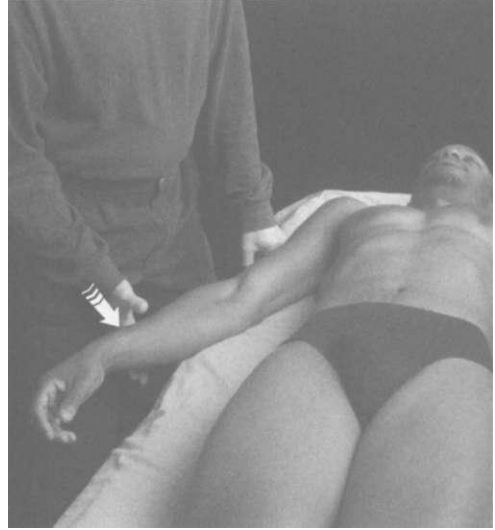
Humerus flexed 90°, elbow locked. Resist extension superior to the wrist.

ABDUCTION OF HUMERUS

Core: Thoracic

Antagonist: Humeral adductors

Synergist: Humeral abductors



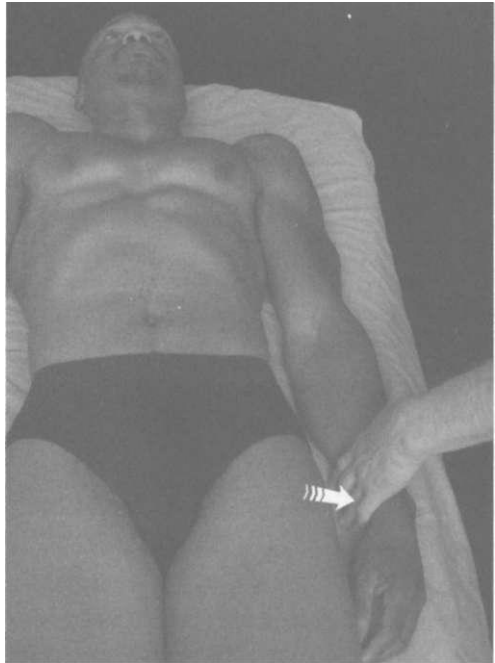
Humerus abducted 20–30°. Resist abduction superior to the wrist.

ADDUCTION OF HUMERUS

Core: Thoracic

Antagonist: Humeral abductors

Synergist: Humeral adductors



Client's arm is straight, elbow locked. Resist adduction superior to the wrist.

HORIZONTAL ADDUCTION OF HUMERUS

Core: Thoracic

Antagonist: Horizontal abductors

Synergist: Horizontal adductors



Humerus flexed 90°, elbow locked. Resist horizontal adduction superior to the wrist.

HORIZONTAL ABDUCTION OF HUMERUS

Core: Thoracic

Antagonist: Horizontal adductors

Synergist: Horizontal abductors



Humerus flexed 90°, elbow locked. Resist horizontal abduction superior to the wrist.

PRONATOR TERES

Attachment: Medial epicondyle of humerus
and Middle of lateral shaft of radius

Action: Pronation of forearm

Core: Thoracic

Antagonist: *Supinator, biceps*

Synergist: *Pronator quadratus,*
internal rotators of shoulder



With the client's elbow bent, grasp his thumb with one hand and place the back of your other hand against the client's back of hand. Resist pronation with both hands.

SUPINATOR

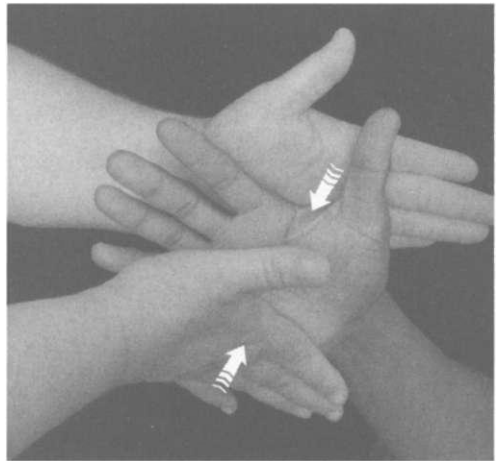
Attachment: Lateral epicondyle of
humerus and Lateral surface of proximal
third of the radius

Action: Supination of forearm

Core: Thoracic

Antagonist: *Pronator teres*

Synergist: *Supinator, biceps,*
external rotators of the shoulder



The client's elbow is bent. Place one of your hands behind his thumb and index finger and your other hand on the hypothenar eminence. Resist supination with both hands. This also tests biceps supination action. When speed or stronger resistance is required, biceps dominate.

FLEXOR CARPI RADIALIS

Attachment: Medial epicondyle of humerus and Bases of the second and third metacarpals

Action: Flexion and abduction of wrist (radial deviation)

Core: Thoracic

Antagonist: *Extensor carpi radialis* (flexion), wrist adductors

Synergist: *Flexor carpi ulnaris*, *flexor digitorum* (both), *brachialis*, *biceps*, *coracobrachialis*, *anterior deltoid*, *upper trapezius*, *scalene*, *extensor carpi radialis* (abduction)



Client's wrist is flexed 45°. Place your hand on the medial wrist in line with the thumb. Resist flexion.

EXTENSOR CARPI RADIALIS LONGUS

Attachment: Lateral supracondylar ridge,
lateral epicondyle of humerus and Base
of second metacarpal

Action: Extension, abduction of wrist
(radial deviation)

Core: Thoracic

Antagonist: *Flexor carpi radialis*
(extension), wrist adductors

Synergist: *Extensor carpi ulnaris*,
extensor digitorum, *brachioradialis*,
triceps, *posterior deltoid*, *upper*
trapezius, *levator scapula*, *scalenes*,
flexor carpi radialis (abduction)

EXTENSOR CARPI RADIALIS BREVIS

Attachment: Lateral epicondyle of
humerus (common extensor tendon)
and Base of third metacarpal

Action: Extension of wrist



Client's wrist extended 45°. Place your hand
on medial wrist in line with the thumb. Resist
extension.

FLEXOR CARPI ULNARIS

Attachment: Humeral head—Medial epicondyle of humerus and Pisiform, hamate, base of fifth metacarpal

Ulnar head—Proximal posterior ulna, olecranon process of ulna and Pisiform, hamate, base of fifth metacarpal

Action: Flexion, adduction of wrist (ulnar deviation)

Core: Thoracic

Antagonist: *Extensor carpi radialis (flexion), wrist abductors*

Synergist: *Flexor carpi radialis, flexor digitorum (both), brachialis, biceps, coracobrachialis, anterior deltoid, upper trapezius, scalene, extensor carpi ulnaris (adduction)*



Client's wrist is flexed 45°. Place your hand on the medial wrist in line with the thumb. Resist flexion.

EXTENSOR CARPI ULNARIS

Attachment: Lateral epicondyle of humerus (common extensor tendon) and Base of fifth metacarpal

Action: Extension, adduction of wrist (ulnar deviation)

Core: Thoracic

Antagonist: *Flexor carpi ulnaris* (flexion), wrist abductors

Synergist: *Extensor carpi radialis*, *extensor digitorum*, *brachioradialis*, *triceps*, *posterior deltoid*, *levator scapula*, *upper trapezius*, *scalenes*, *flexor carpi ulnaris* (adduction)



Client's wrist extended 45°. Place your hand just inferior to the wrist in line with pinkie finger. Resist extension.

FLEXION OF THE WRIST

Core: *Thoracic, cervical*

Antagonist: *Wrist extensors*

Synergist: *Flexor carpi radialis, flexor carpi ulnaris, flexor digitorum (both), brachialis, biceps, anterior deltoid*



Client's elbow bent 90°, wrist extended. Place your palm on client's palm. Stabilize wrist with your other hand. Resist flexion.

EXTENSION OF THE WRIST

Core: *Thoracic, cervical*

Antagonist: *Wrist flexors*

Synergist: *Extensor carpi radialis, extensor carpi ulnaris, extensor digitorum, brachioradialis, triceps, posterior deltoid*



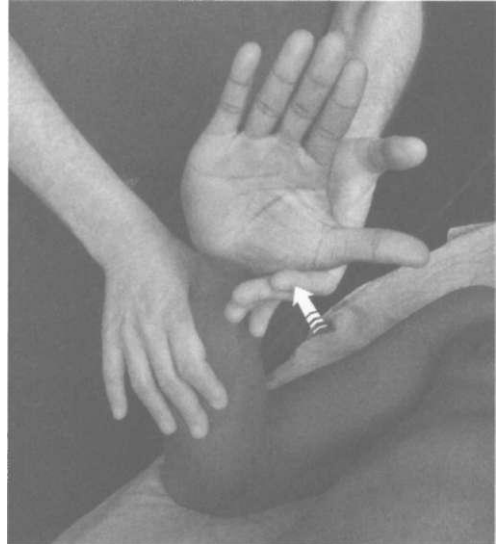
Elbow bent 90°, wrist flexed. Place your hand on back of client's hand. Stabilize wrist with your other hand. Resist extension.

ABDUCTION OF THE WRIST

Core: *Thoracic, cervical*

Antagonist: *Wrist adductors*

Synergist: *Flexor and extensor carpi
radialis, humeral adductors*



Elbow bent 90°; wrist slightly adducted. Place your hand below client's thumb on wrist while your other hand stabilizes the wrist. Resist abduction.

ADDUCTION OF THE WRIST

Core: *Thoracic, cervical*

Antagonist: *Wrist abductors*

Synergist: *Flexor and extensor carpi
ulnaris, humeral abductors*



Elbow bent 90°; wrist slightly adducted. Grasp outside of client's hand while stabilizing wrist with your other hand. Resist adduction.

FLEXOR DIGITORUM SUPERFICIALIS

Attachment: Humeral head—Medial epicondyle of humerus and Sides of shafts of middle phalanges of the four fingers

Ulnar head—Coronoid process of ulna and Sides of shafts of middle phalanges of the four fingers

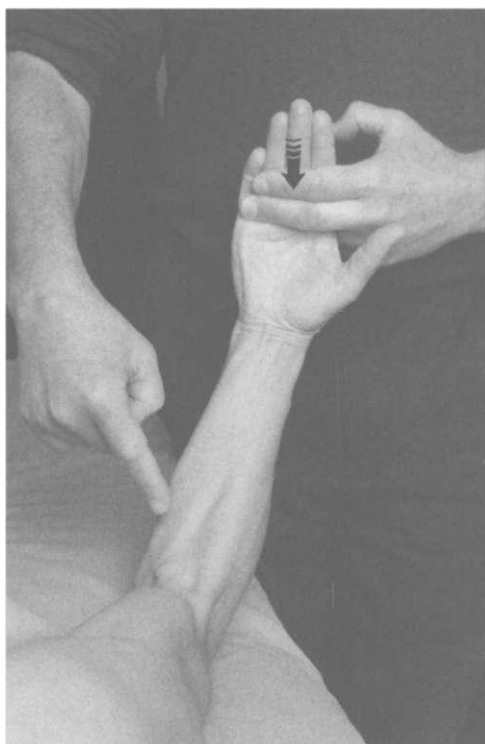
Radial head—Anterior oblique line of radius and Sides of shafts of middle phalanges of the four fingers

Action: Flexion of middle phalanges of the four fingers at PIP (proximal interphalangeal) joints; assists flexion of the wrist

Core: Thoracic

Antagonist: *Extensor digitorum*

Synergist: *Flexor digitorum profundus, flexor carpi radialis; and ulnaris, brachialis, biceps, coracobrachialis, anterior deltoid, upper trapezius, scalene*



Client's wrist flexed 45°. Place your fingers on each of the PIP joints of fingers two through five. Resist flexion.

FLEXOR DIGITORUM PROFUNDUS

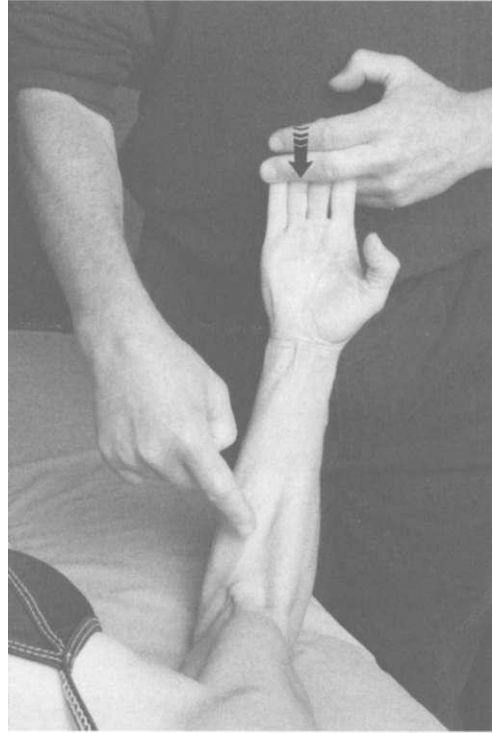
Attachment: Middle of anterior ulna, interosseous membrane and Bases of distal phalanges of the four fingers

Action: Flexion of distal phalanges of the four fingers at DIP (distal interphalangeal) joints; assists flexion of the wrist

Core: Thoracic

Antagonist: *Extensor digitorum*

Synergist: *Flexor digitorum superficialis, flexor carpi radialis and ulnaris, brachialis, biceps, coracobrachialis, anterior deltoid, upper trapezius, scalene*



Client's wrist flexed 45°. Place your fingers on each of the DIP joints of fingers two through five. Resist flexion.

EXTENSOR DIGITORUM

Attachment: Lateral epicondyle of humerus (common extensor tendon) and Extensor expansion of the four fingers

Action: Extension of proximal phalanges of the four fingers at MP (metacarpal phalangeal) joints; assists extension of wrist

Core: Thoracic

Antagonist: Flexor digitorum superficialis and profundus

Synergist: Extensor carpi radialis and ulnaris, brachioradialis, triceps, posterior deltoid, levator scapula, upper trapezius, scalenes



Client's wrist is extended 45°. Place your fingers on the backs of the index through pinkie fingers. Resist extension.

FLEXOR POLLICIS LONGUS

Attachment: Anterior radius, interosseous membrane and Distal phalanx of thumb

Action: Flexion of distal phalanx of thumb

Core: Thoracic

Antagonist: *Extensor pollicis longus*

Synergist: *Flexor carpi radialis, brachialis, biceps, anterior deltoid, upper trapezius, scalene*



Client's elbow bent 90°, fingers curled into palm. Place your index finger on the anterior side of client's straight thumb on distal phalanx. Resist flexion.

EXTENSOR POLLICIS LONGUS

Attachment: Posterior ulna, interosseous membrane and Base of distal phalanx of thumb

Action: Extension of distal phalanx of thumb

Core: Thoracic

Antagonist: *Flexor pollicis longus*

Synergist: *Extensor carpi radialis, brachioradialis, triceps, posterior deltoid, upper trapezius, scalene*



With the client's elbow bent 90°, grasp his four fingers with one hand and curl them into his palm. Place your other index finger on his posterior thumb, distal phalanx. Resist extension.

FLEXOR POLLICIS BREVIS

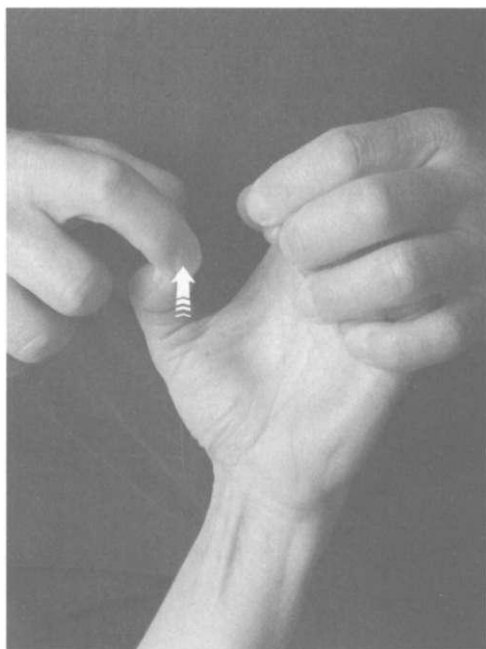
Attachment: Flexor retinaculum and carpal bones and Base of proximal phalanx of thumb

Action: Flexion of proximal phalanx of thumb

Core: *Thoracic*

Antagonist: *Extensor pollicis brevis*

Synergist: *Flexor carpi radialis, brachialis, biceps, anterior deltoid, upper trapezius, scalene, flexor pollicis longus*



Client's elbow is bent, fingers curled into palm. Place your index finger on tip of client's bent thumb. Resist flexion.

EXTENSOR POLLICIS BREVIS

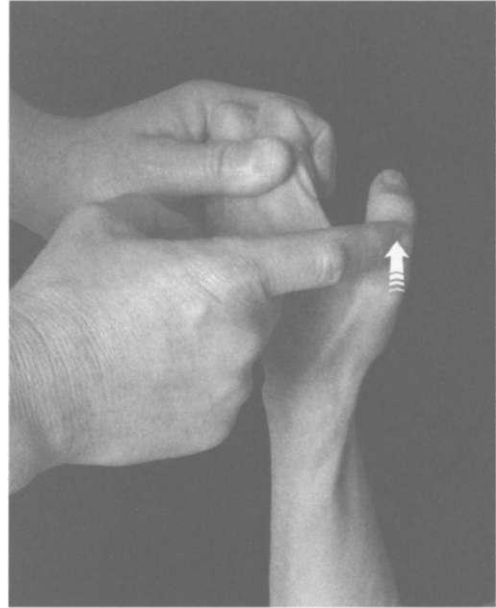
Attachment: Posterior radius, interosseous membrane and Base of proximal phalanx of thumb

Action: Extension of proximal phalanx of thumb

Core: Thoracic

Antagonist: *Flexor pollicis brevis*

Synergist: *Extensor carpi radialis, brachioradialis, triceps, posterior deltoid, upper trapezius, scalene, extensor pollicis longus*



Client's elbow bent 90°, the four fingers curled into palm of hand, thumb bent. Place your index finger on client's posterior thumb, proximal phalanx. Resist extension.

ADDUCTOR POLLICIS

Attachment: Transverse head—Anterior shaft of third metacarpal

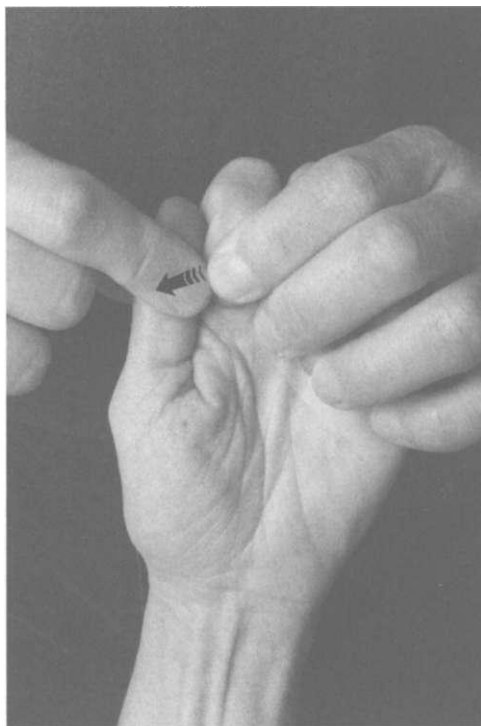
Oblique head—Base of second and third metacarpals, capitate, trapezoid, trapezium and Base of proximal phalanx of thumb (medial side)

Action: Adduction of first metacarpal of thumb at CM (carpalmetacarpal) joint

Core: *Thoracic*

Antagonist: *Abductor pollicis longus and brevis*

Synergist: *Flexor pollicis longus and brevis, opponens pollicis*



Place client's thumb against his index finger.
Pull thumb away from index finger.

ABDUCTOR POLLICIS LONGUS

Attachment: Posterior radius, ulna, interosseous membrane and Base of first metacarpal

Action: Abduction of first metacarpal of thumb at CM joint; also assists wrist abduction

Core: Thoracic

Antagonist: Adductor pollicis

Synergist: Extensor pollicis longus and brevis, extensor carpi radialis and ulnaris, brachioradialis, triceps, posterior deltoid, upper trapezius, scalene



Place client's thumb against his index finger and then move slightly apart. Place your index finger on his posterior thumb, distal phalanx. Resist abduction.

THUMB-TO-FINGER OPPOSITION

Opponens Pollicis

Attachment: Flexor retinaculum, trapezium and Lateral first metacarpal

Action: Opposition of thumb at CM joint

Opponens Digiti Minimi

Attachment: Flexor retinaculum, hook of hamate and Ulnar border of fifth metacarpal

Action: Flexion of proximal phalanx of little finger at MP joint

Core: Thoracic, cervical

Antagonist: Thumb and finger extensors

Synergist: Wrist flexors, biceps, anterior deltoid, trapezius, scalenes, opponens pollicis, flexor digitorum (both)

Core: Thoracic

Antagonist: Thumb and finger extensors

Synergist: (All gripping muscles), flexor digitorum (both), flexor pollicis longus and brevis, flexor carpi radialis and ulnaris



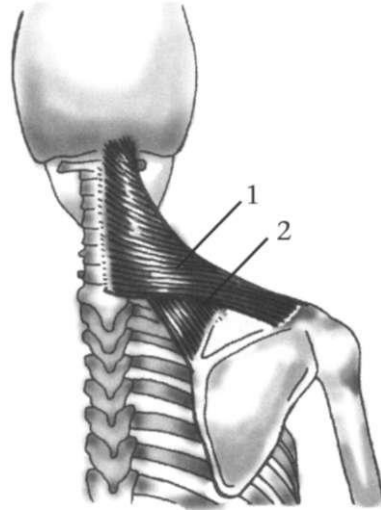
Place tips of client's thumb and little finger together. Ask client to keep them together while you attempt to pull moderately apart.

■ Muscle Group Actions of the Upper Extremities

ELEVATORS OF THE SCAPULA

Posterior

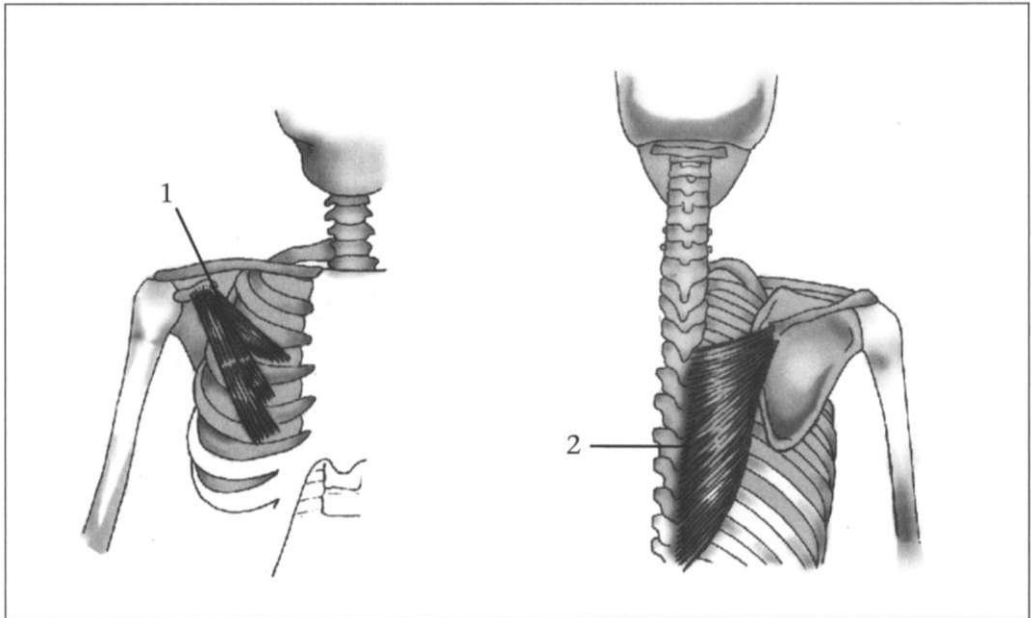
1. Upper Trapezius
2. Levator Scapula



DEPRESSORS OF THE SCAPULA

Anterior and Posterior

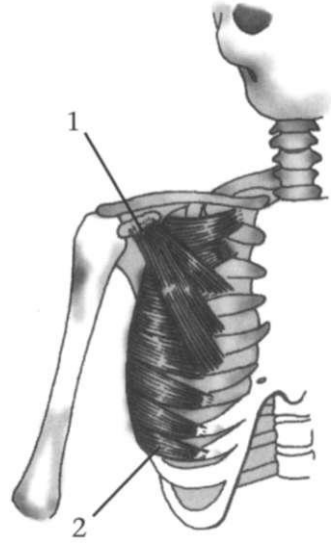
1. Pectoralis
2. Lower Trapezius



PROTRACTORS OF THE SCAPULA

Anterior

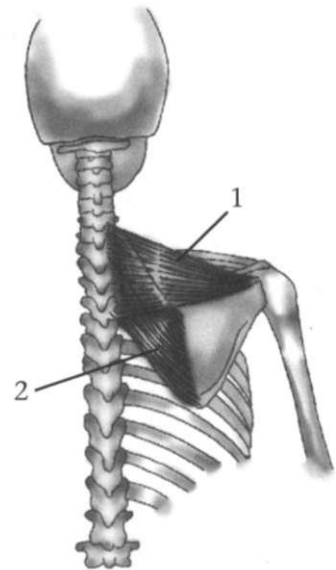
1. Pectoralis Minor
2. Serratus Anterior



RETRACTORS OF THE SCAPULA

Posterior

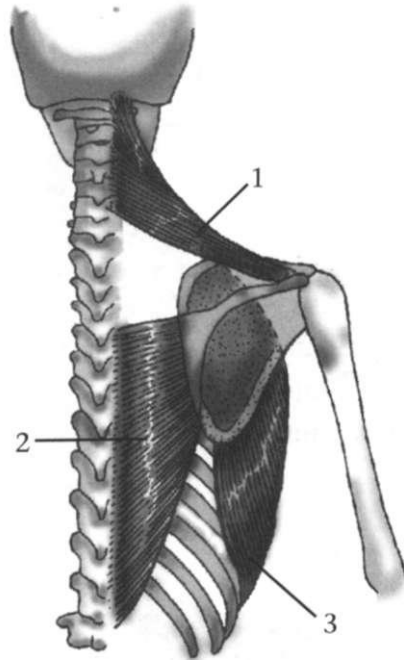
1. Middle Trapezius
2. Rhomboid



UPWARD ROTATORS OF THE SCAPULA

Anterior

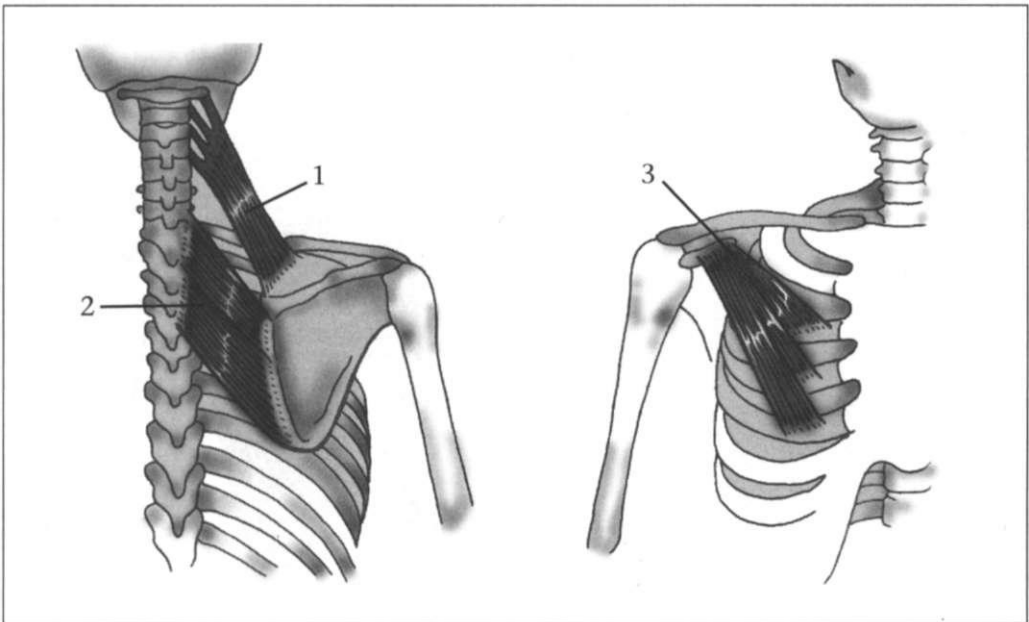
1. Upper Trapezius
2. Lower Trapezius
3. Serratus Anterior



DOWNWARD ROTATORS OF THE SCAPULA

Anterior and Posterior

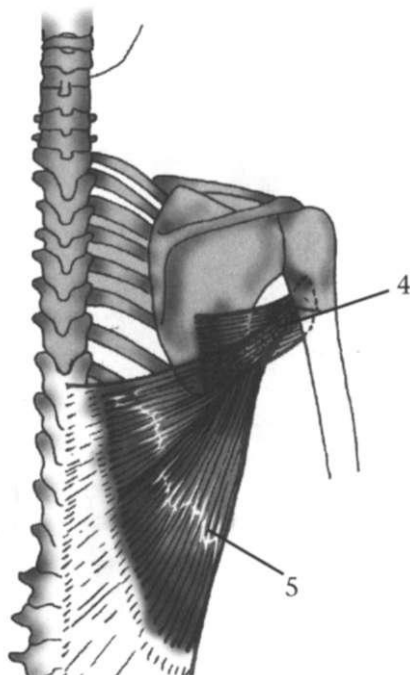
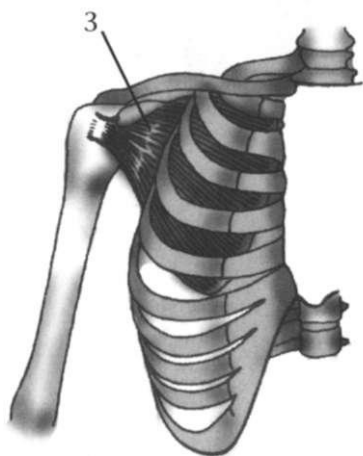
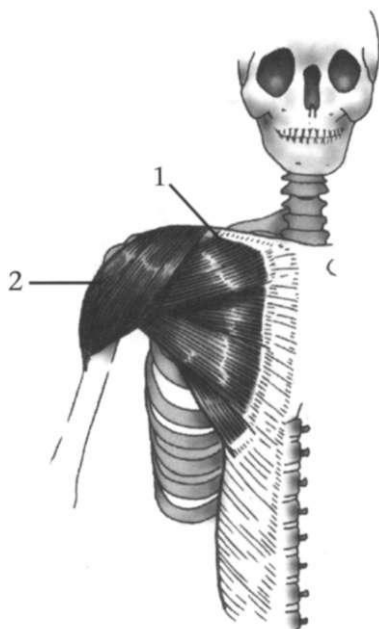
1. Levator Scapula
2. Rhomboids
3. Pectoralis Minor



MEDIAL (INTERNAL) ROTATORS OF THE HUMERUS

Anterior and Posterior

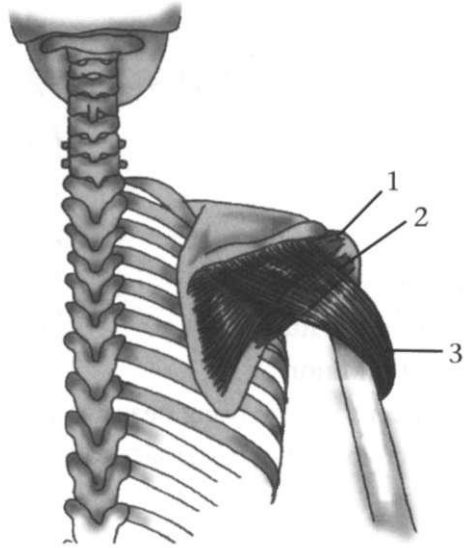
1. Anterior Deltoid
2. Pectoralis Major
3. Subscapularis
4. Teres Major
5. Latissimus Dorsi



LATERAL (EXTERNAL) ROTATORS OF THE HUMERUS

Posterior

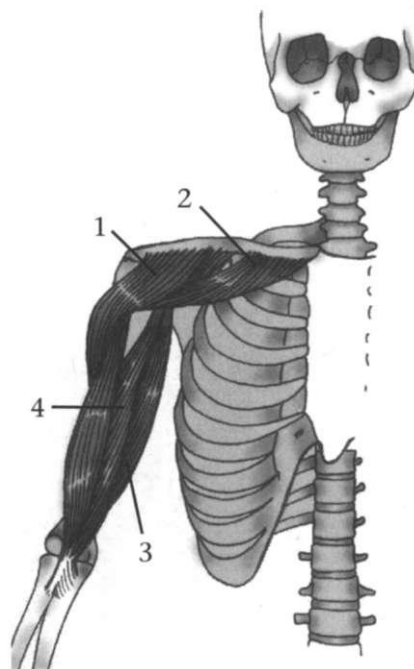
1. Supraspinatus
2. Teres Minor
3. Posterior Deltoid



FLEXORS OF THE HUMERUS

Anterior

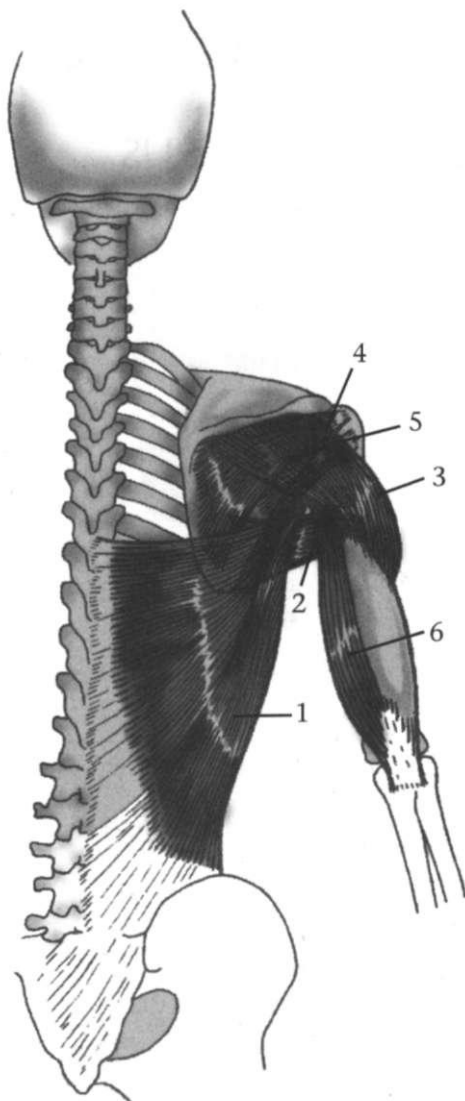
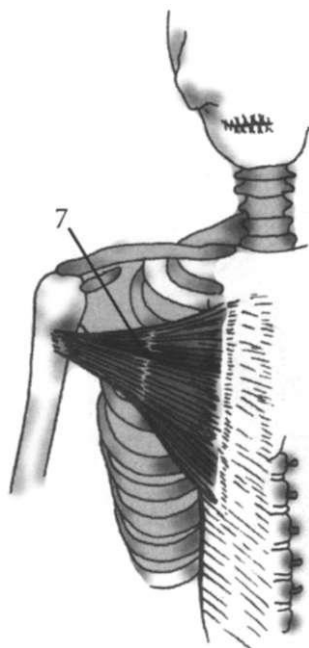
1. Anterior Deltoid
2. Pectoralis Major (clavicular head)
3. Coracobrachialis
4. Biceps Brachii (short head)



EXTENSORS OF THE HUMERUS

Posterior and Anterior

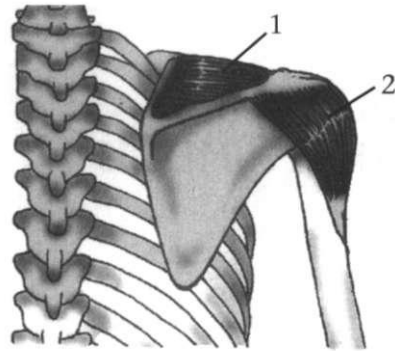
1. Latissimus Dorsi
2. Teres Major
3. Posterior Deltoid
4. Infraspinatus
5. Teres Minor
6. Triceps Brachii (long head)
7. Pectoralis Major (sternal head)



ABDUCTORS OF THE HUMERUS

Posterior

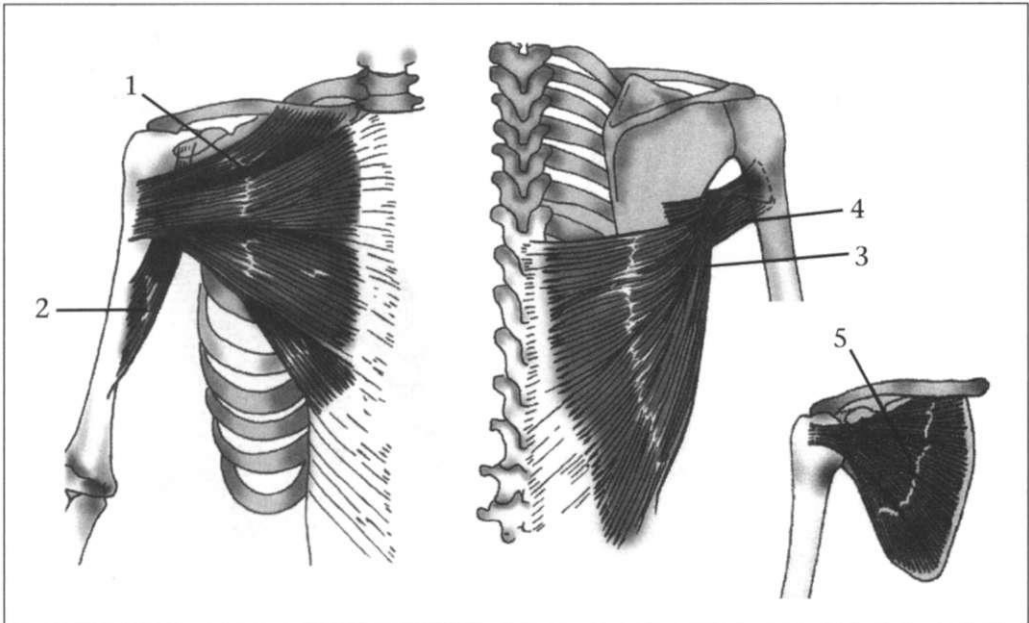
1. Supraspinatus
2. Middle Deltoid



ADDUCTORS OF THE HUMERUS

Anterior and Posterior

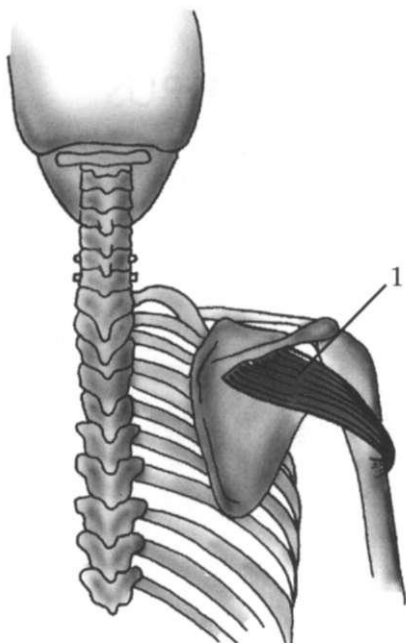
1. Pectoralis
2. Coracobrachialis
3. Latissimus Dorsi
4. Teres Major
5. Subscapularis



HORIZONTAL ABDUCTOR OF THE HUMERUS

Posterior

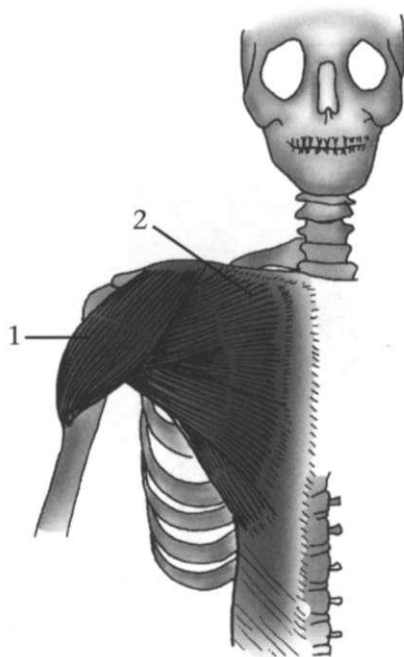
1. Posterior Deltoid



HORIZONTAL ADDUCTORS OF THE HUMERUS

Anterior

1. Anterior Deltoid
2. Pectoralis Major



FLEXORS OF THE ELBOW

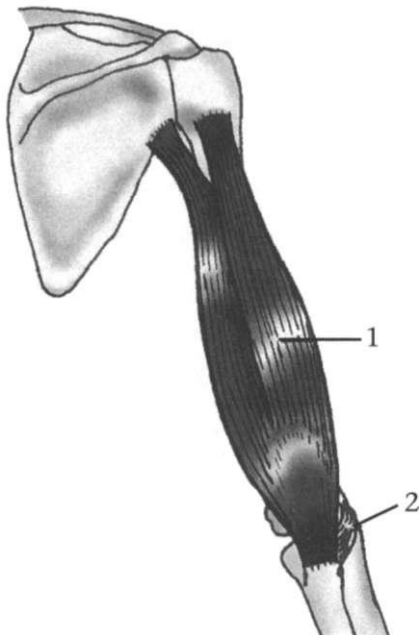
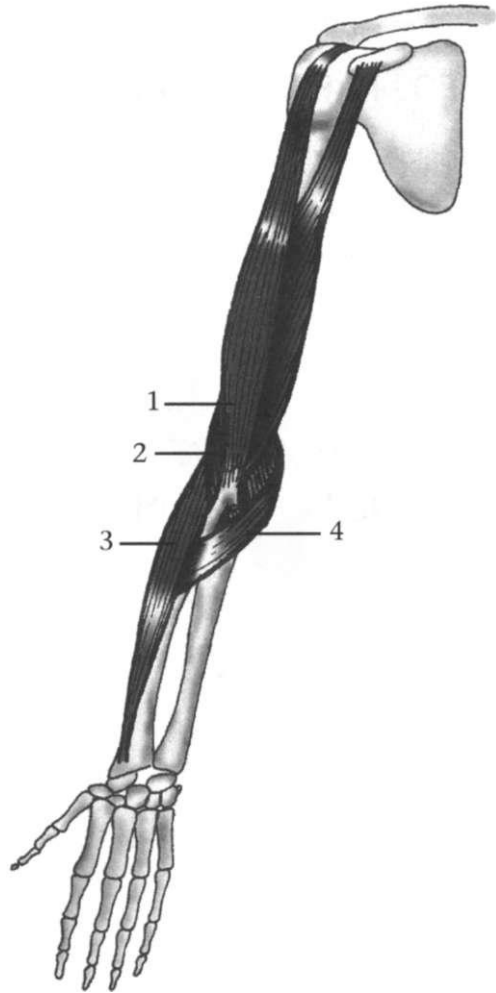
Anterior

1. Biceps Brachii
 2. Brachialis
 3. Brachioradialis
 4. Pronator Teres
-

EXTENSORS OF THE ELBOW

Posterior

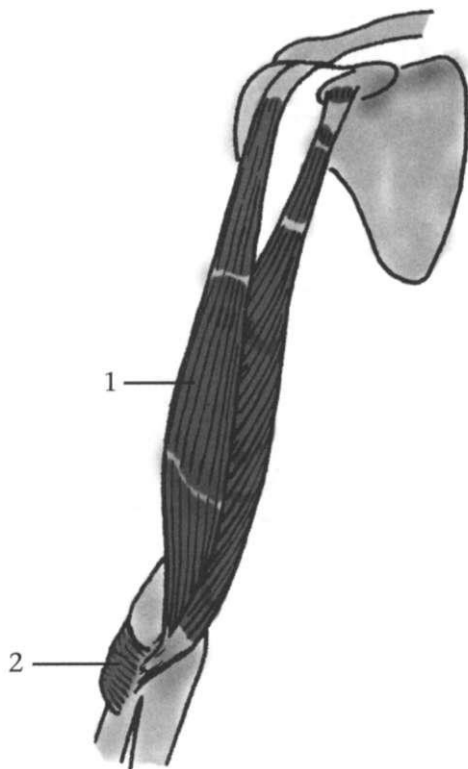
1. Triceps Brachii
2. Anconeus



SUPINATORS OF THE FOREARM

Anterior

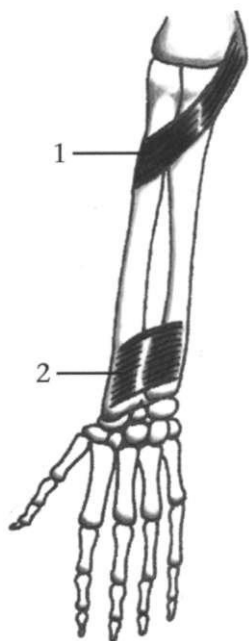
1. Biceps Brachii
2. Supinator



PRONATORS OF THE FOREARM

Posterior

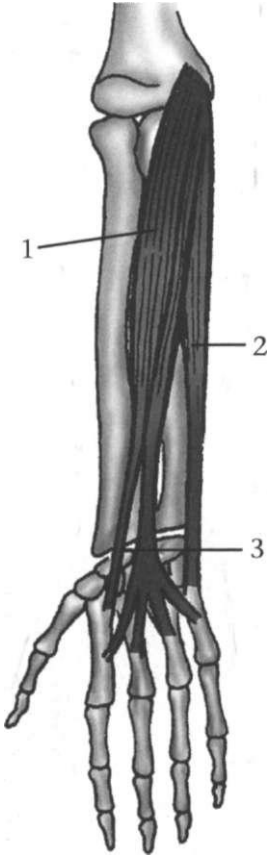
1. Pronator Teres
2. Pronator Quadratus



FLEXORS OF THE WRIST

Anterior

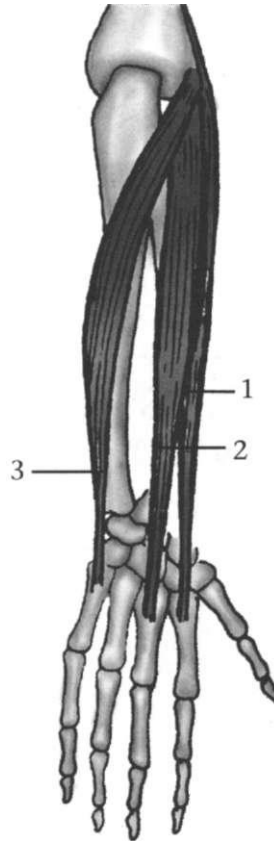
1. Flexor Carpi Radialis
2. Flexor Carpi Ulnaris
3. Palmaris Longus



EXTENSORS OF THE WRIST

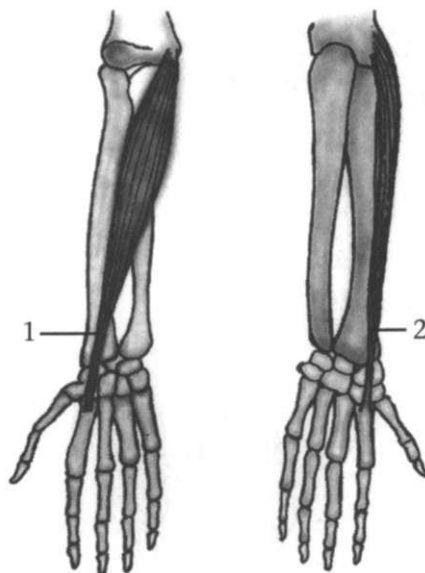
Posterior

1. Extensor Carpi Radialis Longus
2. Extensor Carpi Radialis Brevis
3. Extensor Carpi Ulnaris



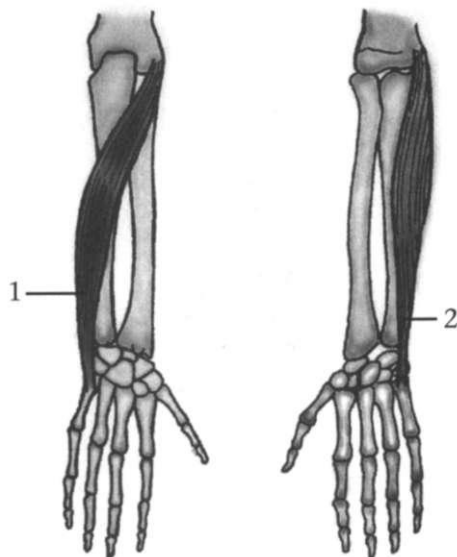
ABDUCTORS OF THE WRIST

1. Flexor Carpi Radialis
2. Extensor Carpi Radialis Longus



ADDUCTORS OF THE WRIST

1. Extensor Carpi Ulnaris
2. Flexor Carpi Ulnaris



ABDUCTORS OF THE THUMB AND DIGITS

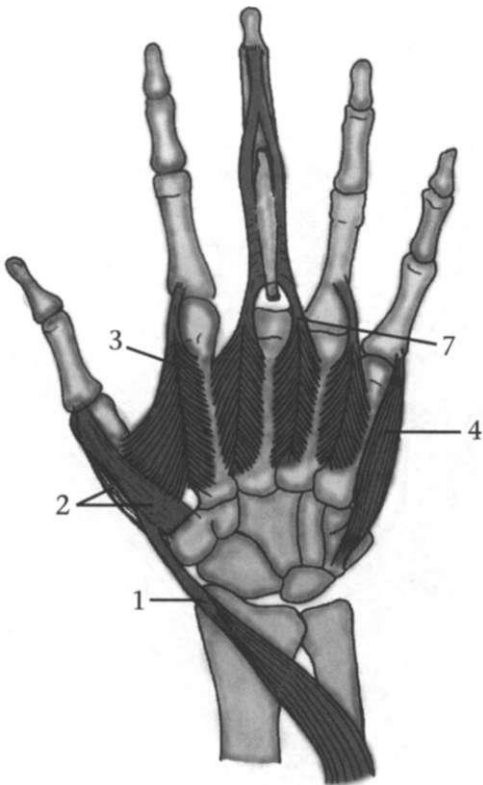
Posterior

Thumb—CM Joint

1. Abductor Pollicis Longus
2. Abductor Pollicis Brevis

Digits—MP Joints

3. Dorsal Interossei, second, third, and fourth fingers
4. Abductor Digiti Minimi



ADDUCTORS OF THE THUMB AND DIGITS

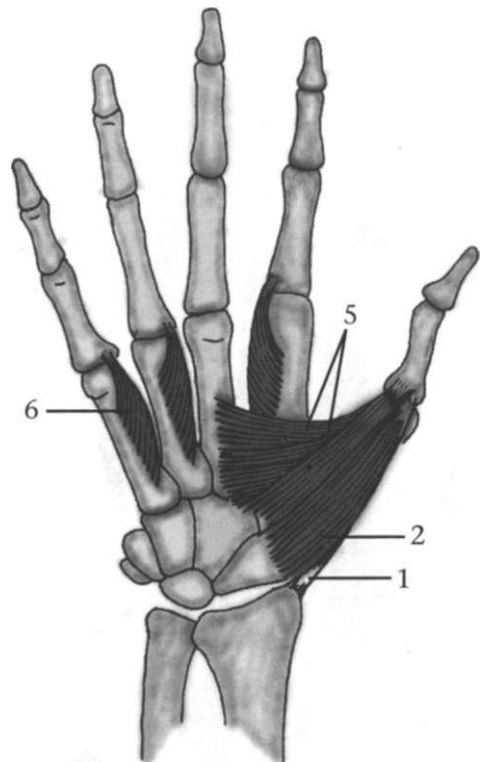
Anterior

Thumb—CM Joint

5. Adductor Pollicis

Digits—MP Joints

6. Palmar Interossei, second, third, fourth, and fifth fingers
7. Dorsal Interosseous, third finger (shown in posterior view)



EXTENSORS OF THE THUMB AND DIGITS

Posterior

Thumb, MP Joint

1. Extensor Pollicis Brevis

IP (Interphalangeal) Joint

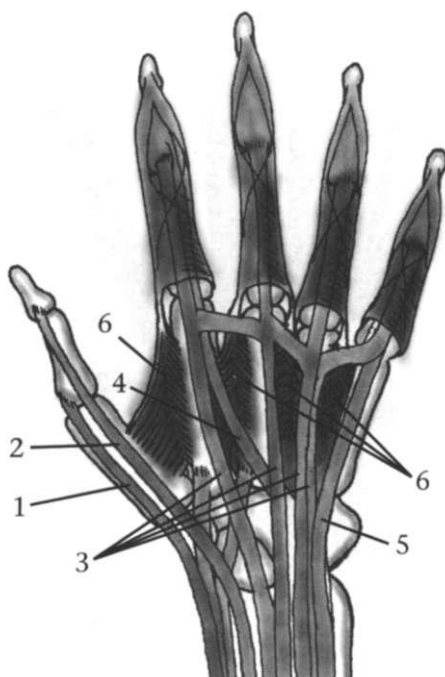
2. Extensor Pollicis Longus

Digits, MP Joints

3. Extensor Digitorum
4. Extensor Indicis
5. Extensor Digiti Minimi

DIP and PIP Joints

6. Dorsal Interossei



FLEXORS OF THE THUMB AND DIGITS

Anterior

Thumb, MP Joints

7. Flexor Pollicis Longus
8. Flexor Pollicis Brevis
- Flexor Digiti Minimi (not shown)
9. Palmar Interossei

DIP Joints

10. Lumbricals
11. Flexor Digitorum Profundus

PIP Joints

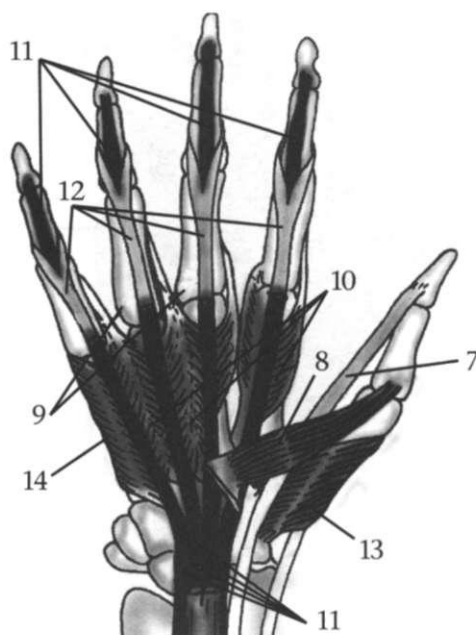
12. Flexor Digitorum Superficialis

Opposition, Thumb

13. Opponens Pollicis

Opposition, Little Finger

14. Opponens Digiti Minimi



III. Torso

RECTUS ABDOMINIS

Attachment: Costal cartilage of ribs 5–7
and Anterior pubis

Action: Flexion of torso

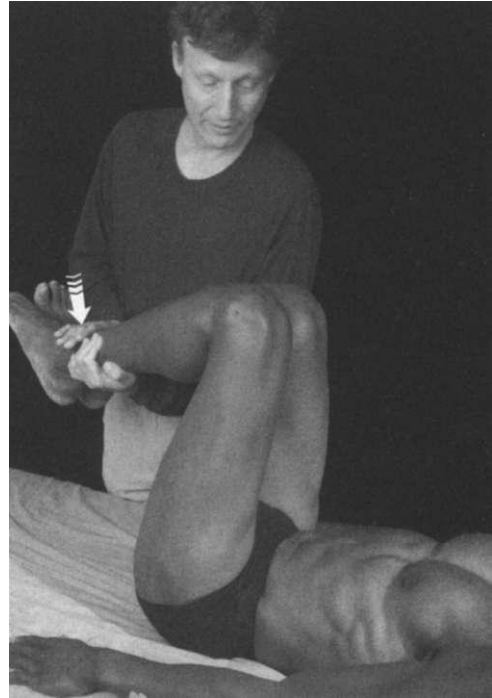
Core: *Lumbar*

Antagonist: *Lumbar erectors,*
gluteus maximus (bilateral), quadra-
tus lumborum (bilateral)

Synergist: *Pectoralis major, neck*
flexors, diaphragm



Rectus abdominis detail



Knees are bent 80° with legs together. Place one hand under lower legs for support while the other hand is just superior to the ankles. Do not attempt this test with lower back pain!

****Pulling umbilicus to spine tests transverse abdominis.**

TORSO ROTATION

Action: Torso rotation (uses ipsilateral), internal oblique, and contralateral external oblique

Core: *Thoracic*

Antagonist: *Opposite rotation*

Synergist: *Pectoralis major sternal, thoracic, and lumbar rotators*



Positioning



Obliques, detail



Client's knees are together, feet off the table. Bring legs to the side. Resist at knees while aiming diagonally to opposite shoulder, which is curled up off the table.

OBLIQUES, SIDE-LYING AND STANDING

Action: Tests ability of internal and external obliques to side-bend

Core: Thoracic

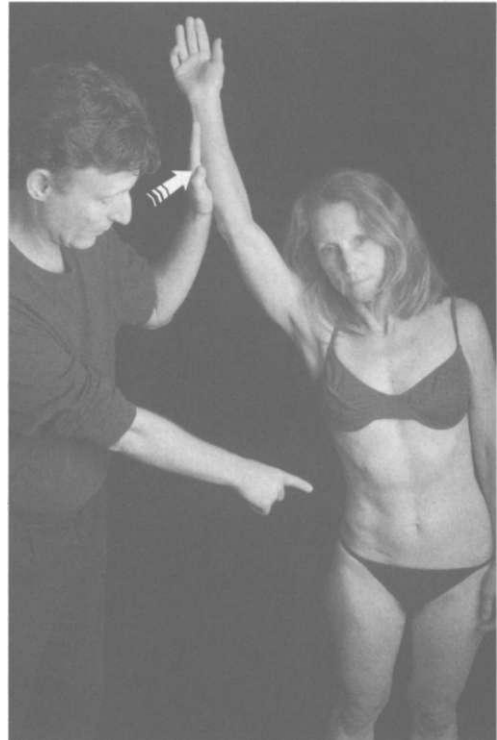
Antagonist: Opposite side-bending muscles

Synergist: Peroneus, tensor fascia latae, gluteus medius, gluteus minimus, quadratus lumborum



Side-Lying

Client is lying on her side, knees bent and together. Lift up the top leg as client keeps the knees together. Place your hand superior to the client's ankle. Resist upward movement.



Standing

Resist lateral bending at forearm. This is used if a person leans to one side. Correct the obliques of the opposite side.

OBLIQUES, EXTERNAL

Attachment: Lower eight ribs (5–12) and Linea alba, pubis, anterior iliac crest

Action: Bilateral—flexion of the trunk, compression of abdominal contents

Unilateral—lateral flexion, rotation of trunk to opposite side

Core: Thoracic, lumbar

Antagonist: Low back muscles, ipsilateral internal oblique (rotation), opposite obliques (side-bending)

Synergist: Contralateral external oblique (rotation), ipsilateral internal oblique (side-bending), other abdominals (flexion)



Client lifts shoulder slightly off the table while bringing the ipsilateral leg to bent-knee position. Place one hand on client's shoulder and one on the knee. Resist movement of knee to shoulder.

OBLIQUES, INTERNAL

Attachment: Inguinal ligament, anterior iliac crest, thoracolumbar aponeurosis and Costal cartilages of the lower four ribs (9–12), abdominal aponeurosis, linea alba

Action: Bilateral—flexion of the trunk, compression of abdominal contents

Unilateral—lateral flexion, rotation of trunk to same side

Core: Thoracic, lumbar

Antagonist: Low back muscles, ipsilateral external oblique (rotation), opposite obliques (side-bending)

Synergist: Contralateral external obliques (rotation), ipsilateral internal oblique (side-bending), other abdominals (flexion)



Client lifts shoulder slightly off the table while bringing contralateral leg to bent-knee position. Place one hand on client's shoulder and one on knee. Resist movement of knee to shoulder.

TRANSVERSE ABDOMINIS

Attachment: Inguinal ligament, iliac crest, thoracolumbar aponeurosis, costal cartilages 7–12 and Abdominal aponeurosis, linea alba, pubis

Action: Flexion of the torso

Core: *Lumbar*

Antagonist: *Lumbar erectors, gluteus maximus (bilateral), quadratus lumborum (bilateral)*

Synergist: *Diaphragm, pectoralis major, neck flexors*



Lift client's legs off table (your hands superior to his ankles) while client pulls umbilicus to lumbar spine and pushes legs into table.

****Without pulling umbilicus to spine, this tests the rectus abdominis.**

QUADRATUS LUMBORUM

Supine and Prone

Attachment: Posterior iliac crest and 12th rib, transverse processes of L1–4

Action: Raises hip and lateral flexion of trunk; bilaterally enables lumbar extension

Core: Lumbar

Antagonist: *Psoas, opposite quadratus lumborum, opposite obliques, abdominals*

Synergist: *Gluteus medius and minimus (hip hike), peroneus, tensor fascia latae, lumbar erectors, ipsilateral obliques, upper trapezius*



Client's legs are straight and together, abducted to opposite side (for prone, adducted to same side). Place one hand on opposite hip to stabilize and the other hand on closest leg superior to the ankle. Resist movement of both legs toward you.

PSOAS

Supine and Prone

Attachment: Lumbar vertebrae T12–L5
and Lesser trochanter of femur

Action: Flexion of femur at hip joint or
flexion of trunk at hip joint

Core: Lumbar, thoracic

Antagonist: *Quadratus lumborum,*
lumbar erectors, gluteus maximus,
hamstrings

Synergist: *Hip flexors, abdominals,*
diaphragm, scalenes, neck flexors



Leg abducted and flexed 45° and rotated externally. Stabilize opposite hip. Place hand superior to ankle and resist adduction and flexing. If necessary, support client's leg with your own.



Leg is straight, hip joint rotated laterally. Lower leg extends off table with leg abducted 45°. Place one hand under the knee and the other under client's foot. Resist downward movement.



Hand positioning

ILIACUS

Supine and Prone

Attachment: Iliac fossa and Lesser trochanter of femur

Action: Flexion of femur at hip joint or flexion of trunk at hip joint

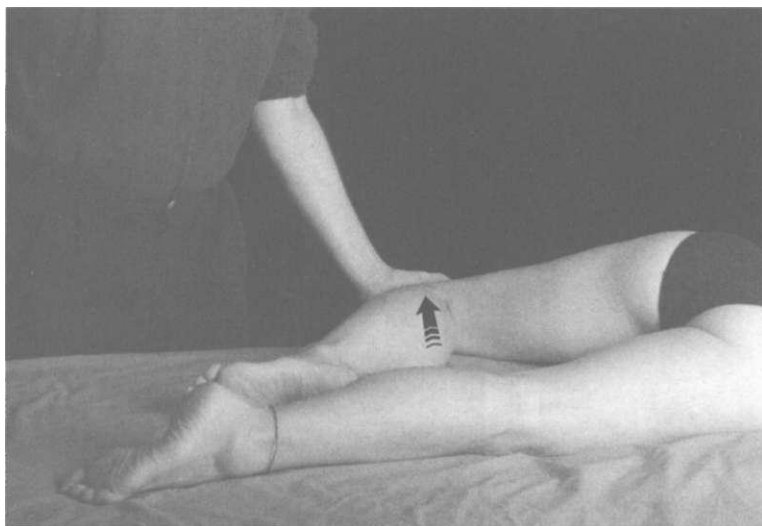
Core: *Lumbar*

Antagonist: *Quadratus lumborum, gluteus maximus, lumbar erectors, hamstrings*

Synergist: *Hip flexors, abdominals, diaphragm, scalenes, neck flexors*



Knee is bent 90° with leg slightly abducted. Support lower leg with your hand under client's ankle and your other hand on top of the medial surface of the knee. Aim knee to outside of ipsilateral ribs. Resist at knee.



Knee is bent and rotated internally. Place hand under knee. Resist downward movement.

ROTATION OF THE THORACIC SPINE

Core: Thoracic

Antagonist: Opposite rotation

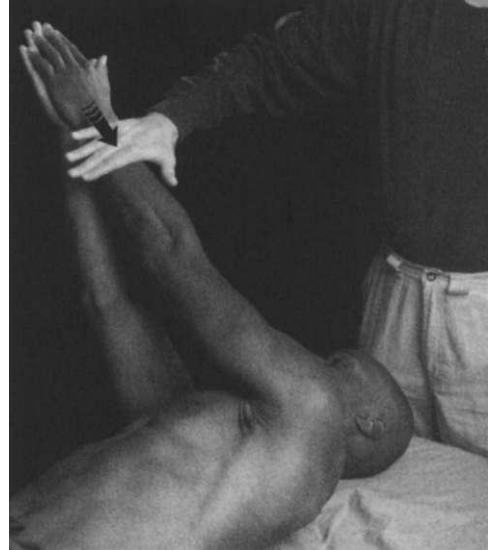
Synergist: Cervical and lumbar rotators



Client turns head to side while simultaneously pushing head and ipsilateral shoulder into table. Place your hand under her shoulder. Resist downward movement of shoulder.



Client turns head to side while simultaneously pushing head and ipsilateral shoulder into table. Place your hand on top of shoulder. Resist upward movement of shoulder.



Palms together, elbows locked. Resist superior to the wrist of the medial arm.

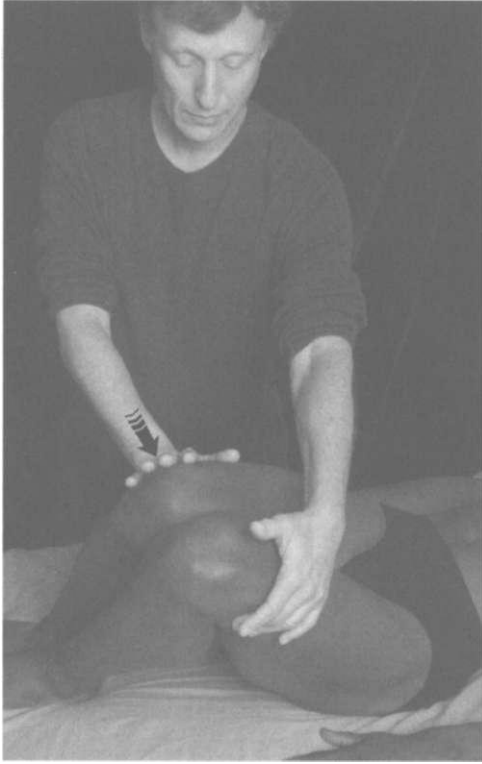


Hand positioning

LUMBAR ROTATION

Supine and Prone

Right Rotation



Client's knees are bent 90° with legs together. He drops both knees slightly over to opposite side. Place hand on same-side knee with the other supporting the opposite knee. Resist movement toward you.

****Reverse position for left rotation.**

Core: *Lumbar*

Antagonist: *Opposite lumbar rotators*

Synergist: *Opposite thoracic rotators, same-side cervical rotators*

Left Rotation



Client's knees are bent 90° with legs together. Rotate his legs slightly to the right. Place your hand superior to the ankle nearest you. Resist sideways movement.

****Reverse position for right rotation.**

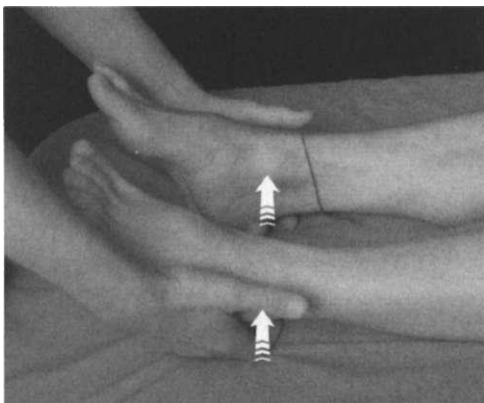
LUMBAR EXTENSION

Supine and Prone

Core: *Lumbar*

Antagonist: *Abdominals, hip flexors*

Synergist: *Calf muscles, hamstrings, gluteus maximus, lumbar erectors, quadratus lumborum, thoracic and cervical erectors*



Place hands under client's ankles. Client pushes legs into table. Resist downward movement. This tests the lumbar erectors and transversospinalis group.

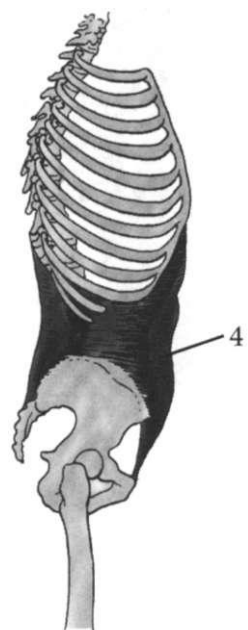
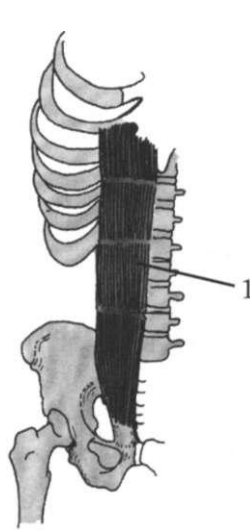


Client raises straight leg off table. Place your hand on her calf while stabilizing the opposite hip with your other hand. Resist upward movement.

■ *Muscle Group Actions of the Torso*

TORSO FLEXORS

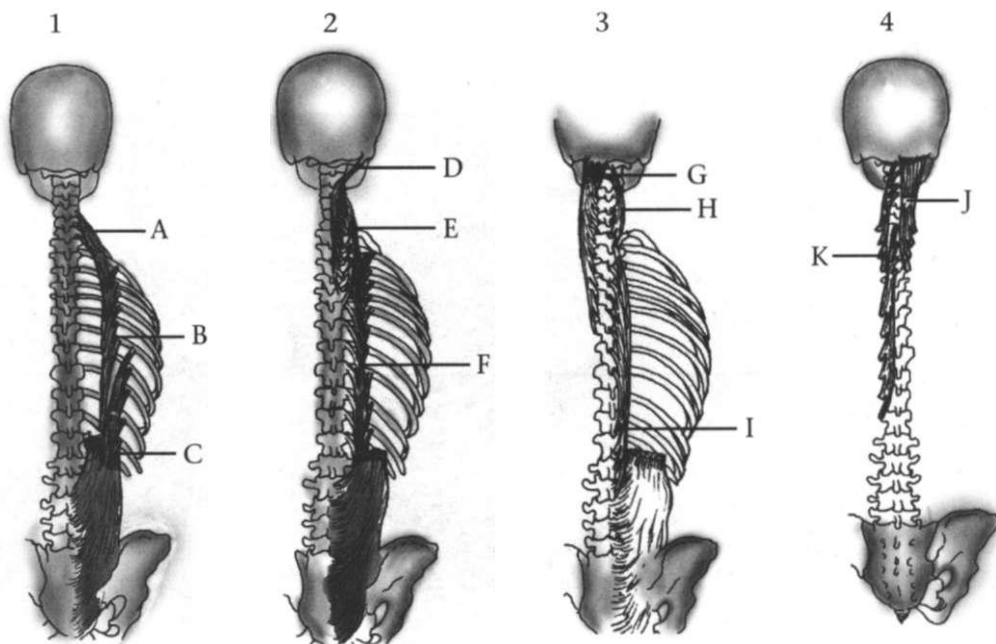
1. Rectus Abdominis
2. External Oblique
3. Internal Oblique
4. Transverse Abdominis



TORSO EXTENSORS

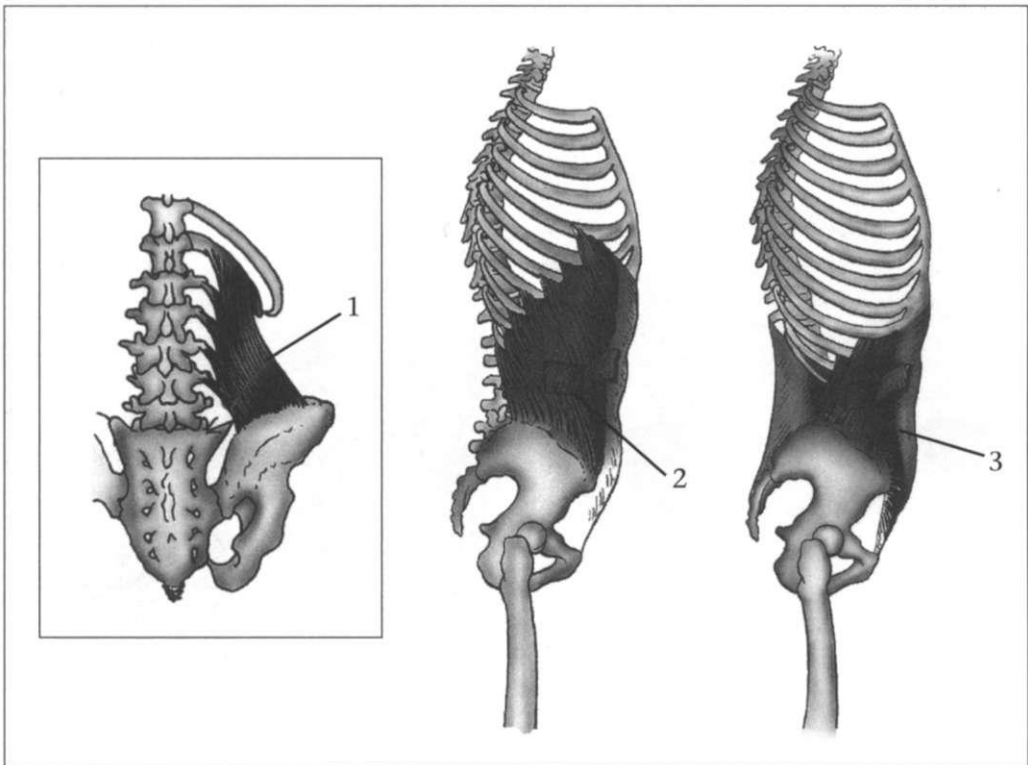
Erector Spinae

1. Iliocostalis: A. Cervicis; B. Thoracis;
C. Lumborum
2. Longissimus: D. Capitis; E. Cervicis;
F. Thoracis
3. Spinalis: G. Capitis; H. Cervicis;
I. Thoracis
4. Semispinalis: J. Capitis; K. Cervicis



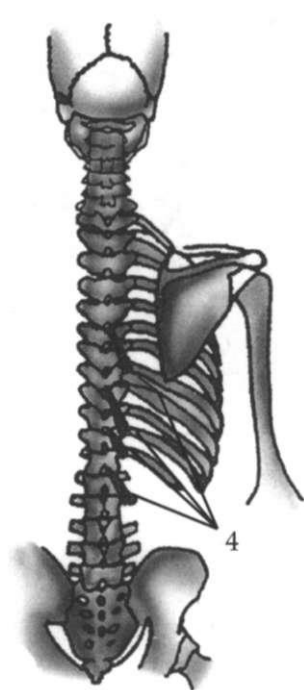
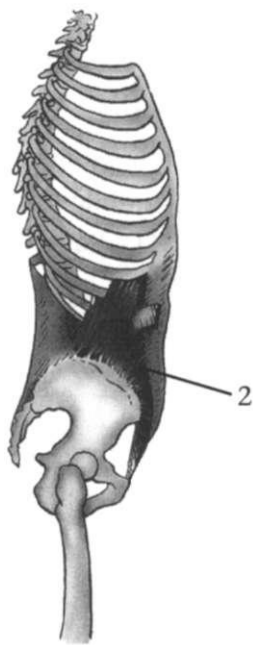
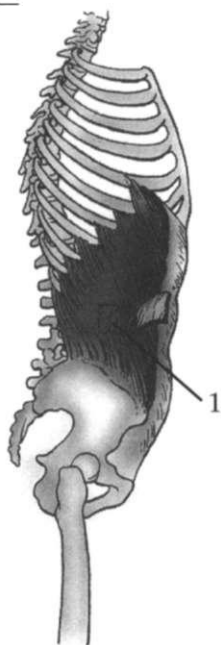
SIDE-BENDING MUSCLES

1. Quadratus Lumborum
2. External Oblique
3. Internal Oblique



TORSO ROTATORS

1. External Oblique
2. Internal Oblique
3. Multifidi
4. Rotatores



IV. Lower Extremities

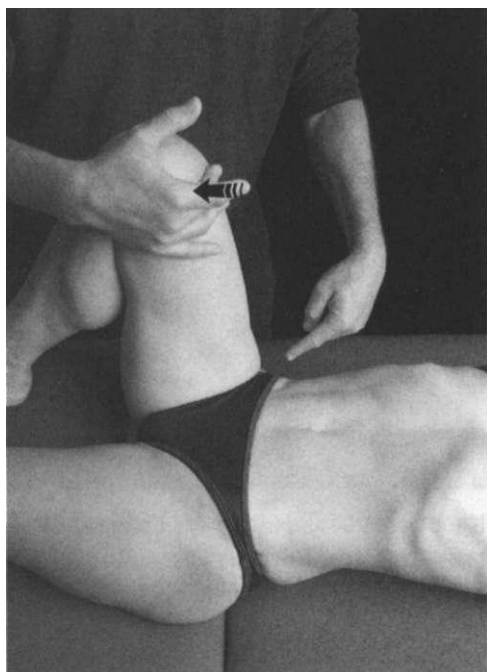
HIP FLEXION

Supine and Prone

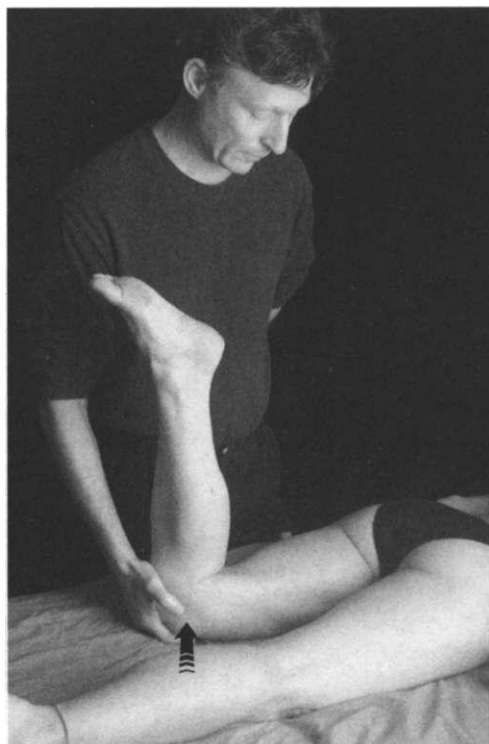
Core: Lumbar

Antagonist: Hip extensors, quadratus lumborum, lumbar erectors

Synergist: Hip flexors, diaphragm, neck flexors



Client's knee is bent with foot slightly off the table. Place your hand on her knee. Resist flexion.



Knee is bent 90°. Place hand under client's knee. Resist downward movement.

HIP EXTENSION

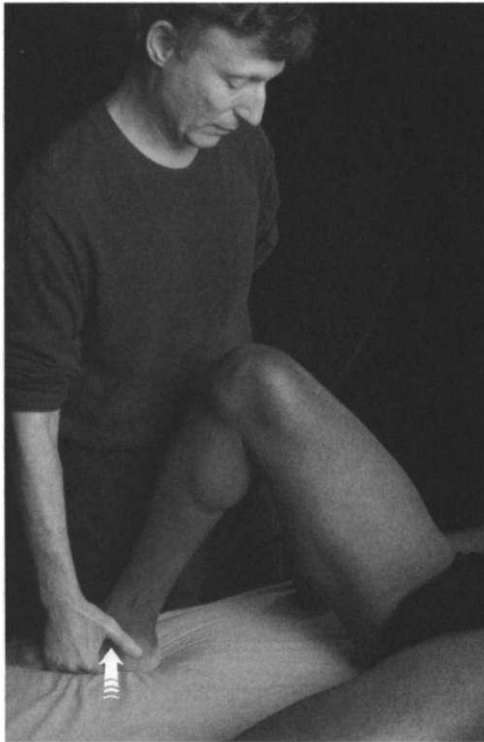
Supine and Prone

Tests gluteus maximus and lumbosacral area

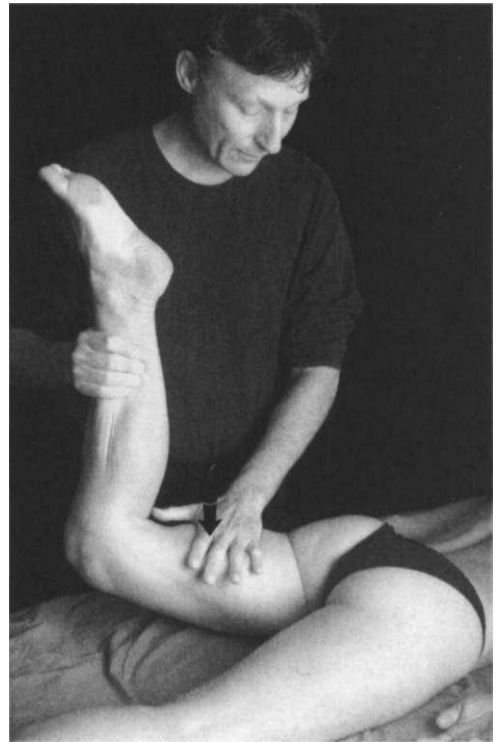
Core: *Lumbar*

Antagonist: *Hip flexors*

Synergist: *Calf muscles, popliteus, hamstrings, gluteus maximus, lumbar erectors, neck extensors*



Knee bent, leg abducted, foot turned out. Place hand under client's foot. Resist downward movement.



Knee bent 90° and lightly lifted off table. Place hand on hamstrings and resist upward movement while your other hand supports the lower leg, grasping it superior to the ankle.

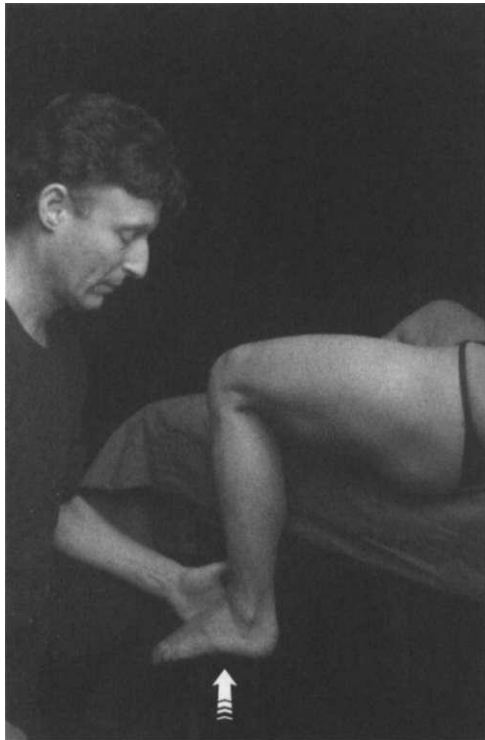
Caution: Don't do in case of low back pain.

GLUTEUS MAXIMUS

Supine and Prone

Attachment: Posterior sacrum, ilium and Iliotibial tract

Action: Hip extension

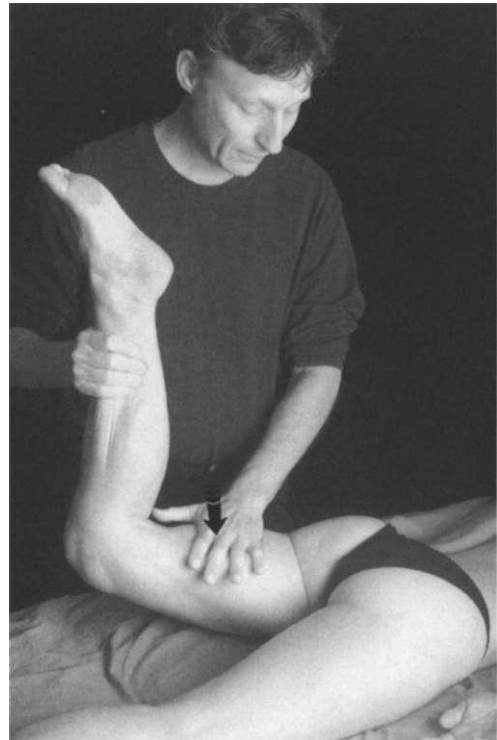


Knee bent 90°, leg off side of table. Your hand is under the client's foot. Resist downward movement.

Core: Lumbar

Antagonist: Hip flexors

Synergist: Calf muscles, popliteus, hamstrings, lumbar extensors, neck extensors



Knee bent 90° and lightly lifted off table. Place hand on hamstrings and resist upward movement while your other hand supports the lower leg, grasping it superior to the ankle.

Caution: Don't do in case of low back pain.

GLUTEUS MEDIUS

Supine and Prone

Attachment: Iliac crest to ilium and
Greater trochanter of femur

Action: Abduction and medial rotation
of femur at hip (anterior fibers)

Core: Lumbar

Antagonist: Hip adductors and lateral rotators

Synergist: Peroneus, tensor fascia latae, gluteus minimus and maximus, quadratus lumborum, obliques, lateral neck flexors



Medial Rotation

Knee bent 90°. Place hand superior to the ankle. Resist outward movement while your other hand stabilizes the knee on the opposite side.



GLUTEUS MEDIUS

(continued)



Side-lying and detail

Client is side-lying, leg straight at 0° flexion, abducted 30°. Place hand superior to client's ankle. Resist upward movement.



Core: *Lumbar*

Antagonist: *Hip adductors and lateral rotators*

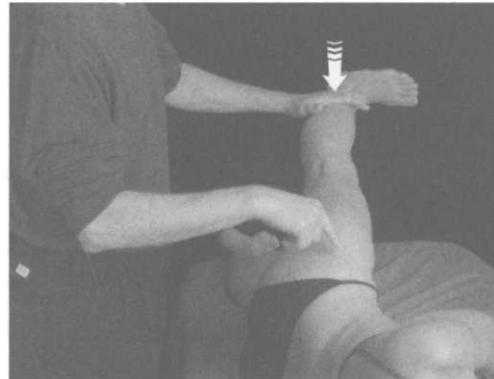
Synergist: *Gluteus maximus and medius, tensor fascia latae, quadratus lumborum, piriformis, biceps femoris*

GLUTEUS MINIMUS

Side-Lying

Attachment: Posterior ilium and Anterior surface of greater trochanter of femur

Action: Abduction and medial rotation of femur at hip



Leg straight in 15° of flexion. Place hand superior to ankle. Resist upward movement.

****Supine and prone tests same as gluteus medius.**

TENSOR FASCIA LATAE

Supine, Side-Lying, and Prone

Attachment: Iliac crest and IT tract to lateral condyle of tibia

Action: Abduction, medial rotation, hip flexion, knee extension; reinforces lateral knee movement

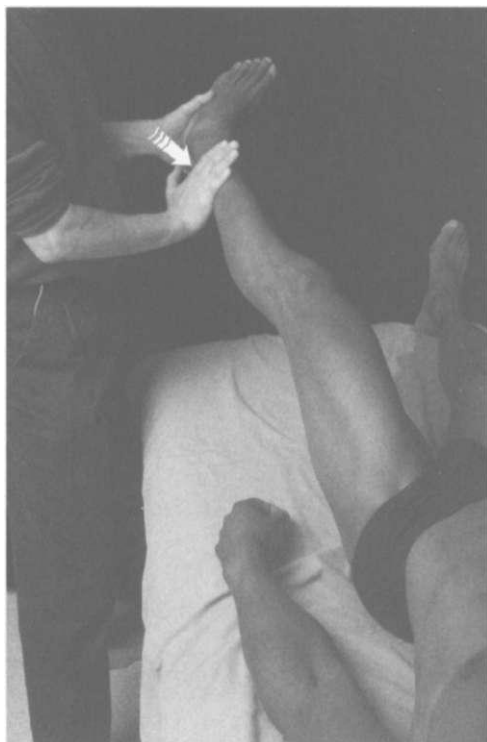


Tensor Fasciae Latae details

Core: Lumbar

Antagonist: Hip extensors, lateral rotators and adductors, knee flexors

Synergist: Peroneus, vastus lateralis, gluteus medius and minimus, quadratus lumborum, obliques, lateral flexors of neck



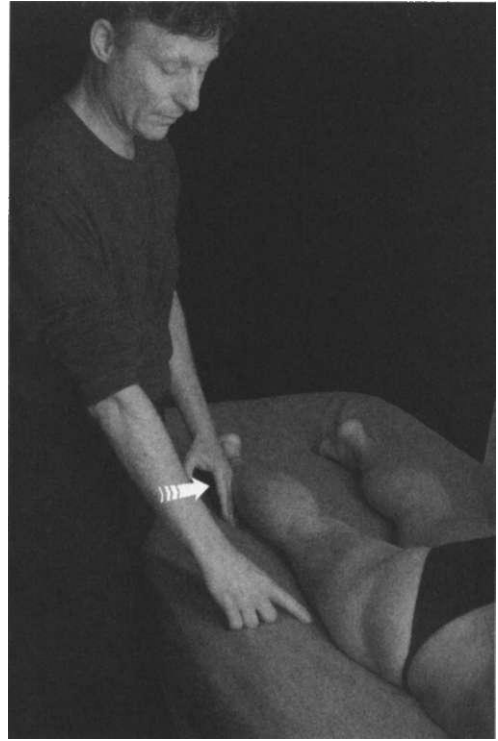
Client's leg is straight, slightly abducted and flexed 30°. Turn his foot in. Place hand superior to ankle. Resist upward and outward movement.

TENSOR FASCIA LATAE

(continued)



Client's leg is straight in 30° of flexion, abducted 30° . Place hand superior to client's ankle. Resist upward movement.



Leg is straight. Place hand superior to ankle. Resist abduction.

PIRIFORMIS

Supine and Prone

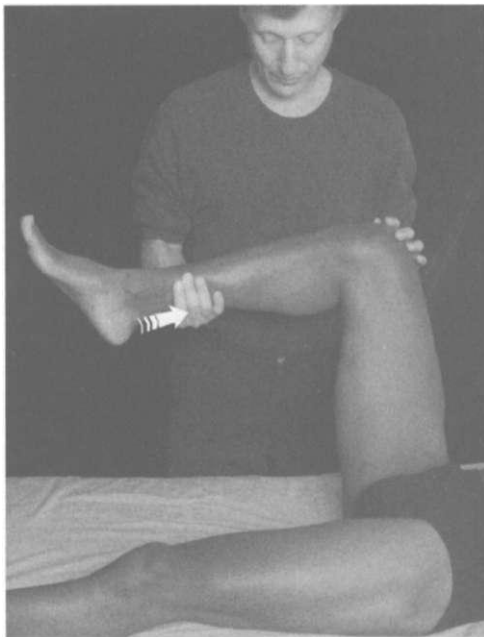
Attachment: Anterior sacrum and Greater trochanter of femur (superior position)

Action: External rotation of hip

Core: Lumbar

Antagonist: Internal rotators of hip

Synergist: Gluteus maximus, gluteus medius, gemellus superior, obturator internus, gemellus inferior, obturator externus, quadratus femoris, quadratus lumborum, hamstrings



Knee is bent 90°. Place one hand superior to inside ankle and your other on the outside of the client's knee. Resist inward movement of ankle.



Piriformis detail



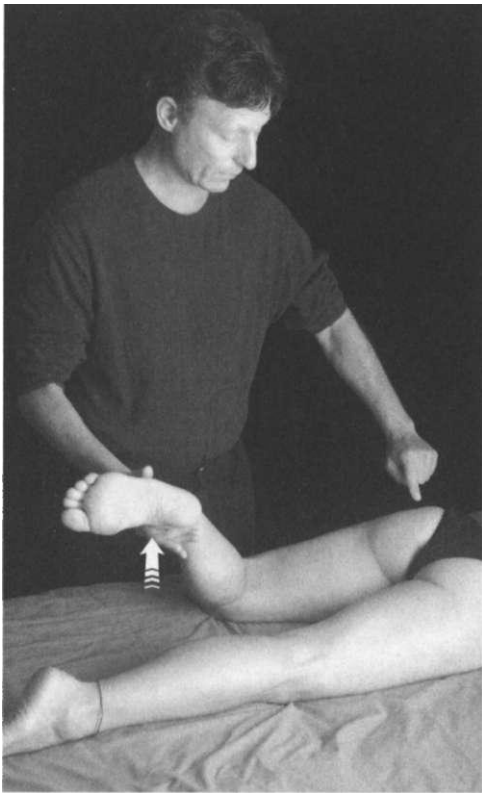
Knee is bent 90°. Place hand superior to client's inside ankle. Resist inward movement.

OBTURATOR INTERNUS

Supine and Prone

Attachment: Ischium and Greater trochanter of femur below piriformis

Action: Lateral rotation of hip; “suspends” hip joint



Knee is bent and laterally rotated, with foot angled down to opposite mid calf. Place your hand on opposite side of client's ankle. Resist inward and downward movement.

Core: Lumbar

Antagonist: Medial rotators of hip

Synergist: Lateral rotators of hip, gluteus maximus, gluteus medius, gluteus minimus, quadratus lumborum



Client's knee is bent 90° with hip slightly abducted. Place one hand on outside of her knee for support and your other hand superior to the inside ankle. Resist upward and inward movement.

OBTURATOR EXTERNUS

Supine and Prone

Attachment: Ischium, obturator foramen and Greater trochanter of femur below obturator internus

Action: Lateral rotation of hip; “suspends” hip joint

Core: Lumbar

Antagonist: Medial rotators of hip

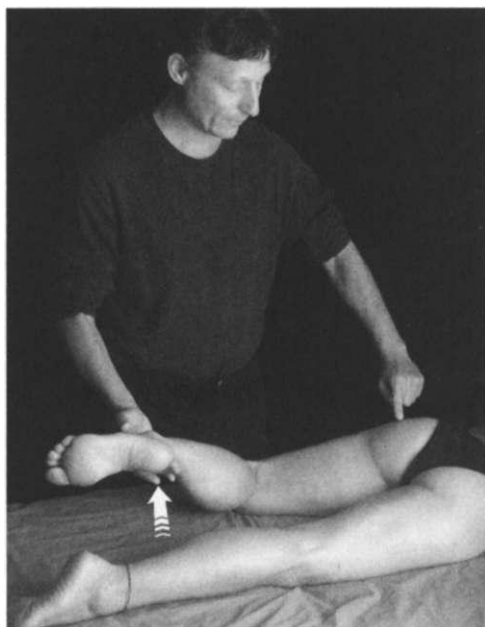
Synergist: Lateral rotators of hip, gluteus maximus, gluteus medius, gluteus minimus, quadratus lumborum



Obturator Externus details



Client's knee is bent 90° with hip abducted to 45°. Place one hand on outside of her knee for support and your other hand superior to the inside of the ankle. Resist upward and inward movement.



Knee is bent and laterally rotated. Foot is angled down to opposite Achilles tendon. Place hand on opposite side of ankle. Resist inward and downward movement.

ADDUCTION

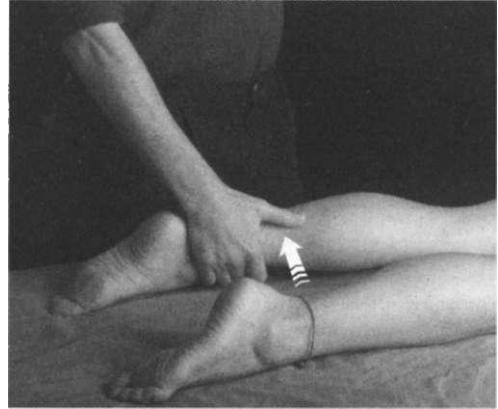
(Includes all five adductors)

Prone

Core: *Lumbar*

Antagonist: *Hip abduction*

Synergist: *Hip adductors, flexors, medial rotators*



Leg is straight. Place hand on medial side of leg superior to ankle. Resist adduction.

PECTINEUS

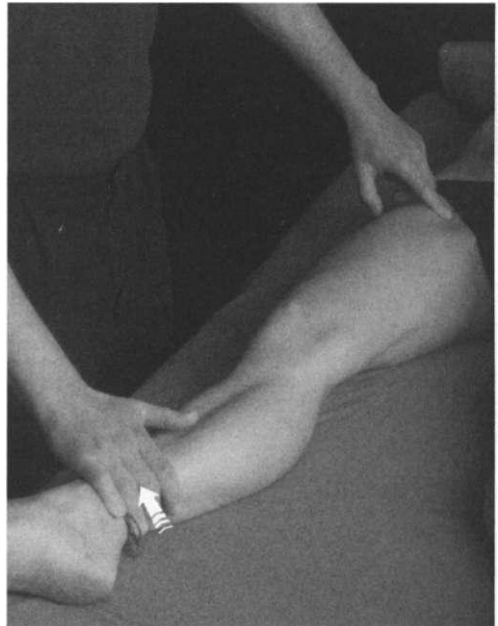
Attachment: Anterior pubis and Below lesser trochanter of femur

Action: Flexion, adduction, and medial rotation of hip

Core: *Lumbar*

Antagonist: *Hip extensors, abductors, lateral rotators*

Synergist: *Hip flexors, adductors, medial rotators*



Leg straight, foot turned completely out. Resist adduction superior to the ankle.

ADDUCTOR BREVIS

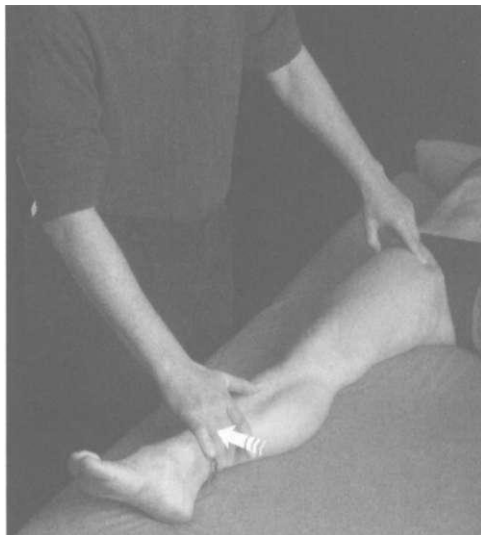
Attachment: Anterior pubis and Below pectineus on femur

Action: Flexion, adduction, and medial rotation of hip

Core: Lumbar

Antagonist: Hip abductors, lateral rotators and extensors

Synergist: Hip adductors, medial rotators and flexors



Leg straight, foot turned out 45°. Resist adduction superior to ankle.

ADDUCTOR LONGUS

Attachment: Anterior pubis and Below adductor brevis on femur

Action: Flexion, adduction, and medial rotation of hip

Core: Lumbar

Antagonist: Hip abductors, lateral rotators and extensors

Synergist: Hip adductors, medial rotators and flexors



Leg straight, foot straight up. Resist adduction superior to ankle.

ADDUCTOR MAGNUS

Supine and Prone

Attachment: Anterior—Inferior ramus of pubis, below adductor longus on femur and Adductor tubercle

Posterior—Ischial tuberosity, ramus of ischium and Adductor tubercle

Action: Anterior—Adduction, flexion, and medial rotation of hip

Posterior—Extension and lateral rotation of femur at hip

Core: *Lumbar*

Antagonist: *Anterior—Hip abductors, extensors, and lateral rotators*

Posterior—Hip flexors and medial rotators

Synergist: *Anterior—Hip adductors, flexors, and medial rotators*

Posterior—Hip extensors and lateral rotators



Adductor Magnus detail, supine and prone



Anterior Head: Leg straight, foot turned in 45°. Resist adduction superior to ankle.



Posterior Head: Leg straight, heel turned in 45°. Place hand superior to medial heel. Resist extension.

GRACILIS

Attachment: Inferior ramus of anterior pubis and Pes anserinus

Action: Hip adduction, flexion, and medial rotation of flexed knee

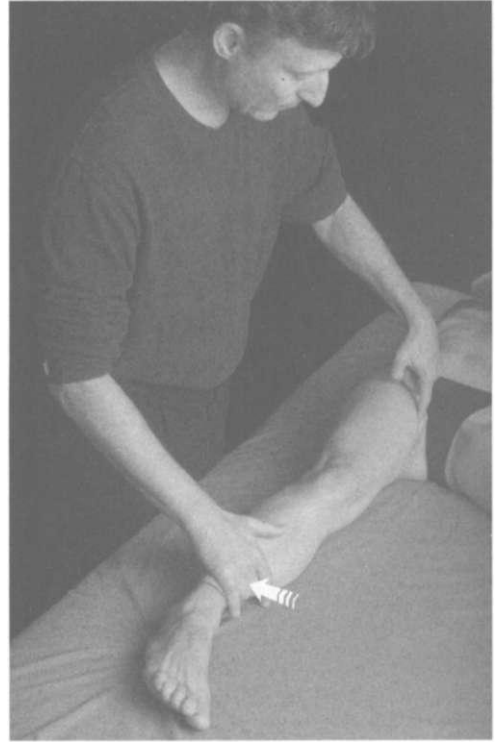
Core: *Lumbar*

Antagonist: *Hip abductors and extensors, biceps femoris*

Synergist: *Hip adductors and flexors, sartorius, semitendinosus*



Gracilis detail

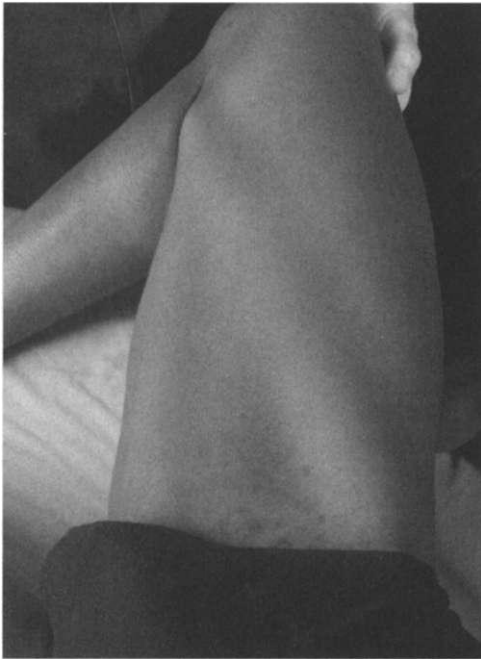


Leg straight, foot turned completely in. Resist adduction superior to the ankle.

SARTORIUS

Attachment: Anterior superior iliac spine and Pes anserinus

Action: Assists flexion, abduction, and lateral rotation of femur at hip, assists flexion and medial rotation of knee

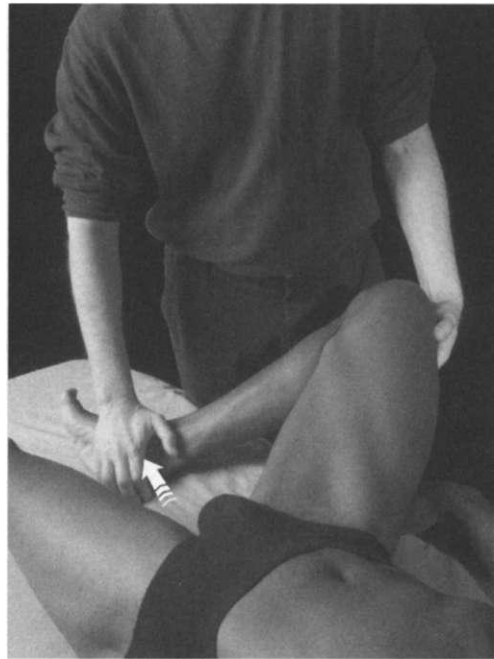


Sartorius detail

Core: Lumbar

Antagonist: *Hip extensors, adductors, and medial rotators, extensors and lateral rotators of the knee*

Synergist: *Hip flexors, abductors, lateral rotators, knee flexors and medial rotators*



Knee bent, slightly above table. Put one of your hands under the knee to stabilize and the other hand at the heel. Resist movement of heel toward groin.

RECTUS FEMORIS

Supine and Prone

Attachment: Anterior inferior iliac spine
and Upper margin of acetabulum

Action: Hip flexion and extension
of knee

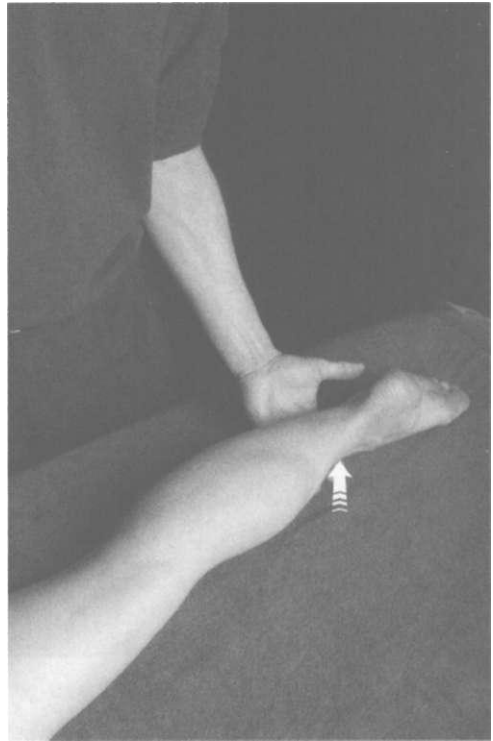
Core: Lumbar

Antagonist: Calf muscles,
hamstrings, gluteus maximus,
lumbar erectors

Synergist: Three other quadriceps,
tibialis anterior, hip flexors, abdomi-
nals, neck flexors



Leg is straight in 30° of flexion. Have client lock knee with toes pointed to ceiling. Place hand superior to the ankle. Resist flexion.



Leg is straight with knee locked. Place your hand superior to the ankle. Resist flexion.

VASTUS INTERMEDIUS

Supine and Prone

Attachment: Anterior and lateral femoral shaft and Patella and via patellar ligament to tibial tuberosity

Action: Extension of knee

Core: *Lumbar*

Antagonist: *Flexors of knee*

Synergist: *Knee extensors, tibialis anterior, iliopsoas*



Knee bent 90°, foot straight with toes up. Support back of knee. Resist extension superior to ankle.

VASTUS MEDIALIS

Supine and Prone

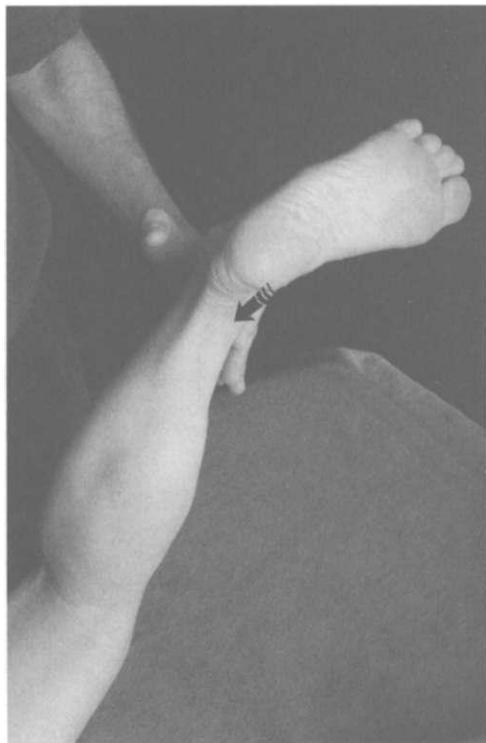
Attachment: Linea aspera on posterior femur and Patella and via patellar ligament to tibial tuberosity

Action: Extension of knee

Core: Lumbar

Antagonist: Medial hamstrings

Synergist: Rectus femoris, vastus intermedius, vastus lateralis, adductors, psoas, iliacus



Knee bent, lower leg rotated medially. Support back of client's knee with one hand and place your other hand superior to the medial ankle. Resist extension.

VASTUS LATERALIS

Supine and Prone

Attachment: Linea aspera on posterior femur and Patella and via patellar ligament to tibial tuberosity

Action: Extension of knee

Core: *Lumbar*

Antagonist: *Biceps femoris*

Synergist: *Rectus femoris, vastus intermedius, vastus medialis, IT band, tensor fascia latae, iliacus*



Knee bent, lower leg rotated laterally. Support back of client's knee with one hand. Place other hand superior to the lateral ankle. Resist extension.

BICEPS FEMORIS

Supine and Prone

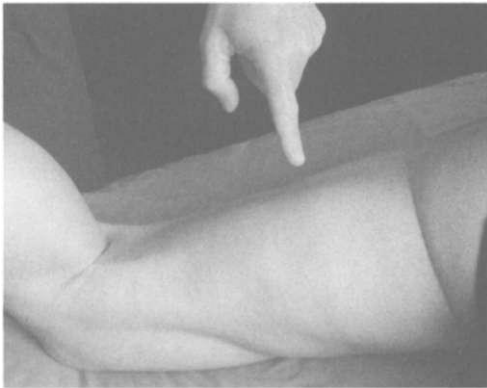
Attachment: Ischial tuberosity and Head of fibula

Action: Extension of hip, flexion of knee, and lateral rotation of flexed knee

Core: Lumbar, thoracic

Antagonist: Hip flexors, knee extensors, medial rotators of flexed knee

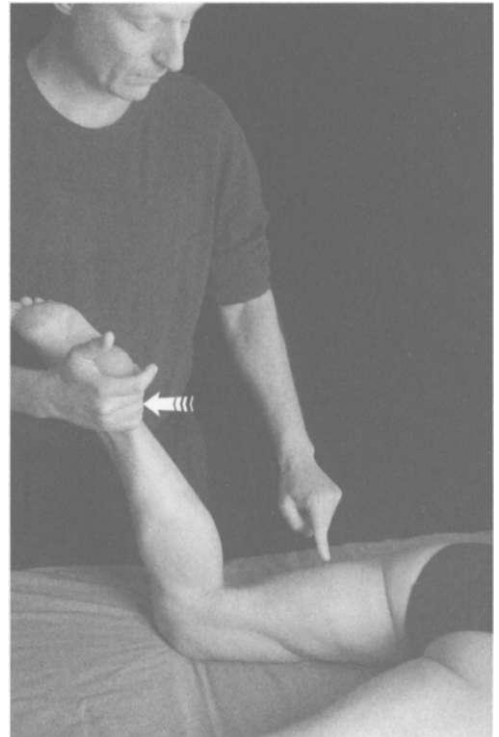
Synergist: Calf muscles, gluteus maximus, piriformis, quadratus lumborum, lumbar extensors, neck extensors



Biceps femoris detail



Knee bent, foot turned out. Place your hand superior to client's heel. Resist knee flexion.



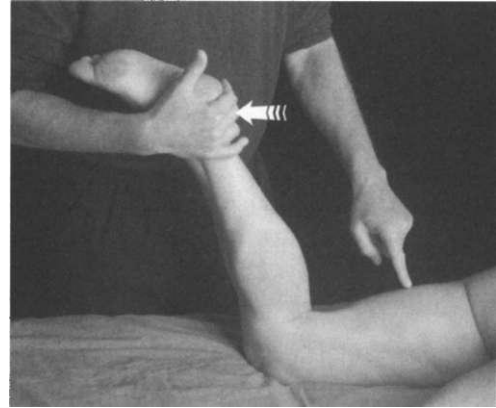
Knee bent, foot rotated out. Place hand behind client's heel. Resist knee flexion (may have to place hand on hamstring to prevent cramping).

SEMITENDINOSUS AND SEMIMEMBRANOSUS

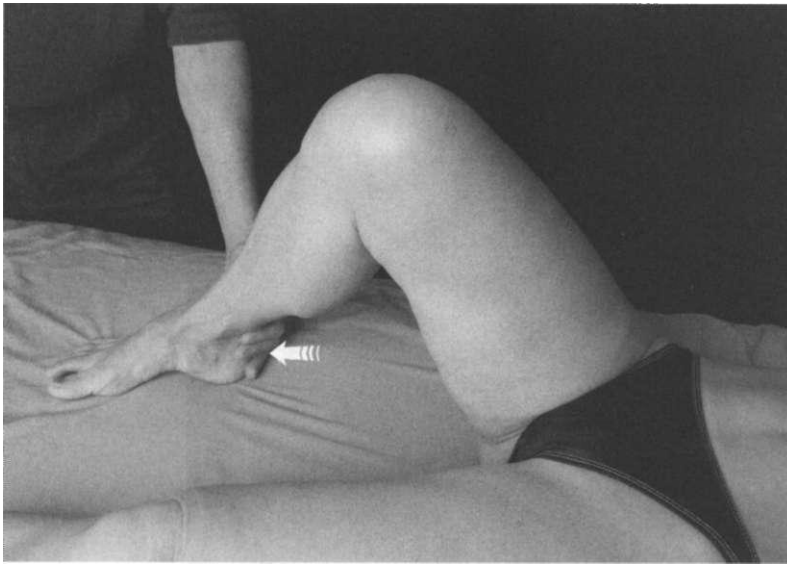
Attachment: Semitendinosus—Ischial tuberosity and Pes anserinus

Semimembranosus—Ischial tuberosity and Medial tibial condyle

Action: Extension of hip, flexion of knee, and medial rotation of flexed knee



Knee is bent, foot turned in. Place your hand behind client's heel. Resist knee flexion.



Knee is bent, foot turned in. Place your hand superior to client's heel. Resist knee flexion.

HAMSTRINGS GROUP

Supine and Prone

Action: Extension of hip, flexion of knee

Core: Lumbar, thoracic

Antagonist: Hip flexors, knee extensors

Synergist: Flexor hallucis longus, popliteus, calf muscles, gluteus maximus, lumbar erectors, cervical extensors



Knee is bent, foot straight. Place your hand on client's heel. Resist knee flexion.



Knee is bent, foot straight. Place your hand superior to client's heel. Resist knee flexion.

POPLITEUS

Supine and Prone

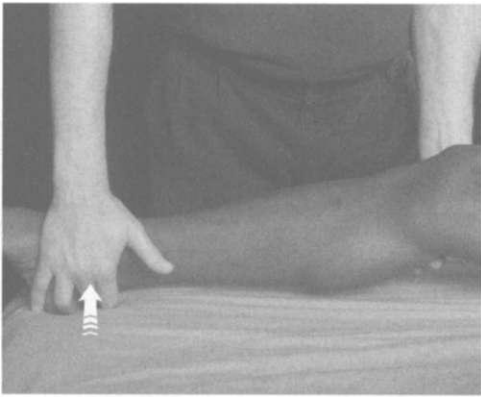
Attachment: Lateral condyle of femur and
Posterior proximal tibial shaft

Action: Initiates knee flexion, medial
rotation of tibia

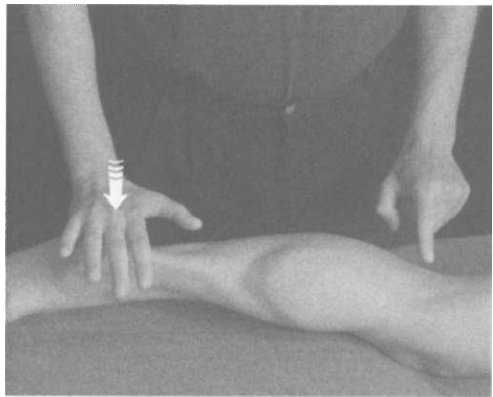
Core: Lumbar, thoracic

Antagonist: Quadriceps,
dorsiflexors of ankle, evertors of foot

Synergist: Flexor hallucis longus,
calf muscles, hamstrings, gluteus
maximus, lumbar erectors, cervical
extensors, gracilis, sartorius



Leg straight. Place hand under client's knee to slightly flex it. Place other hand superior to the medial heel with foot slightly turned in. Resist knee flexion.



Leg is straight, heel turned in. Place your hand on client's heel. Resist knee flexion (tests first 10–15° of knee flexion).

GASTROCNEMIUS

Supine and Prone

Attachment: Medial and lateral epicondyle of femur and Calcaneus via Achilles tendon

Action: Plantarflexion of ankle, flexion of knee

Core: Lumbar, thoracic

Antagonist: Ankle dorsiflexors, knee extensors

Synergist: Flexor hallucis longus, soleus, hamstrings, gluteus maximus, lumbosacral area, neck extensors



Client's leg is straight. Place hand on ball of foot. Resist plantarflexion.



Leg is straight, foot on table. Place hand on ball of client's foot and support the underside of the ankle with your other hand. Resist plantarflexion.

SOLEUS

Supine and Prone

Attachment: Posterior tibia and fibula
and Calcaneus via Achilles tendon

Action: Plantar flexion of ankle

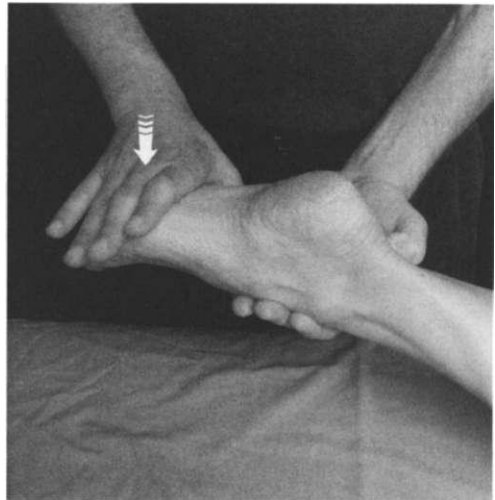
Core: Lumbar, thoracic

Antagonist: Ankle dorsiflexors

Synergist: Flexor hallucis longus,
gastrocnemius, hamstrings,
gluteus maximus, lumbosacral area,
neck extensors



With the client's knee bent, put your fist in the ball of the foot. Resist plantarflexion.



Knee bent with foot slightly off the table. Place hand on ball of foot while supporting underside of ankle with your other hand. Resist plantarflexion.

TIBIALIS POSTERIOR

Supine and Prone

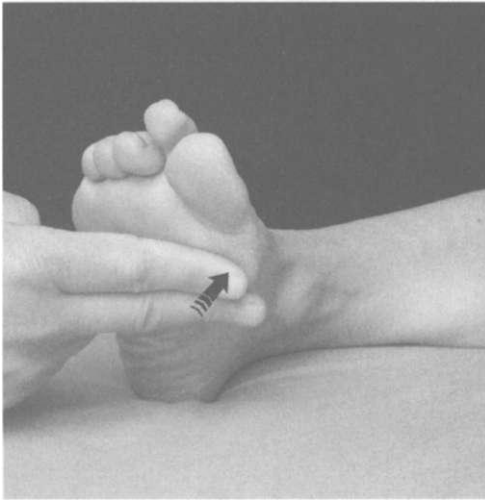
Attachment: Posterior tibia, fibula and Navicular, adjacent tarsals, and metatarsals on plantar surface

Action: Plantarflexion of ankle, inversion of foot

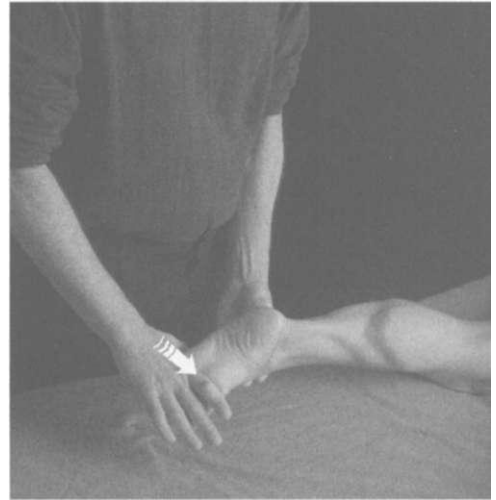
Core: Lumbar, thoracic

Antagonist: Dorsiflexors of ankle, evertors of foot

Synergist: Flexor hallucis longus, calf muscles, hamstrings



Client's leg is straight with foot turned in. Place your fingers on the ball of the big toe. Resist plantarflexion and inversion.



Leg is straight, foot turned in. Place your hand on medial ball of foot and support underside of ankle with other hand. Resist plantarflexion.

TIBIALIS ANTERIOR

Supine and Prone

Attachment: Lateral condyle and lateral shaft of tibia, interosseous membrane and Base of first metatarsal (plantar surface), first medial cuneiform (plantar surface)

Action: Dorsiflexion of ankle, inversion of foot

Core: Lumbar, thoracic

Antagonist: Ankle plantarflexors, foot evertors

Synergist: (Dorsiflexion) quadriceps, iliopsoas, extensor hallucis longus; (Inversion) muscles of medial arch, adductors, iliopsoas



Client's leg is straight, ankle slightly plantarflexed. Resist dorsiflexion superior to base of big toe.



PERONEUS TERTIUS

Supine and Prone

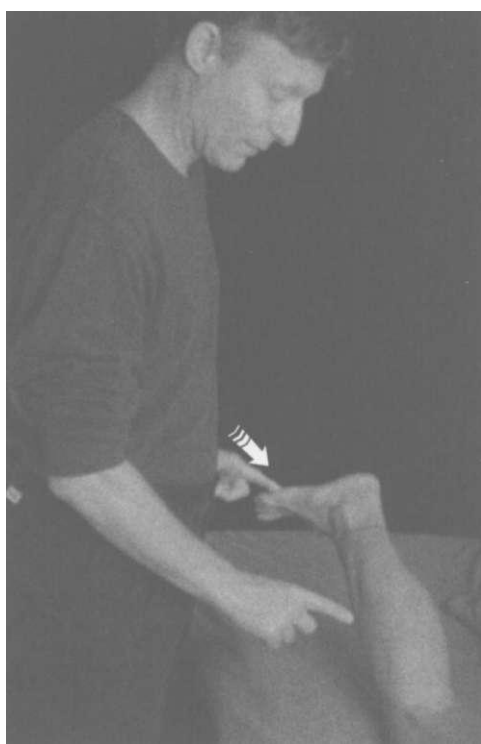
Attachment: Anterior distal fibula and
Base of fifth metatarsal

Action: Eversion of foot with dorsiflexion

Core: Lumbar, thoracic

Antagonist: Foot invertors with
plantarflexion

Synergist: *Peroneus longus and
brevis, extensor digitorum, tensor
fascia latae, gluteus medius and
minimus, quadratus lumborum*



Resist eversion of foot in a dorsiflexed position.

PERONEUS LONGUS AND BREVIS

Supine and Prone

Attachment: Longus—Head and upper two-thirds of lateral shaft of fibula and Base of first metatarsal, first cuneiform (plantar)

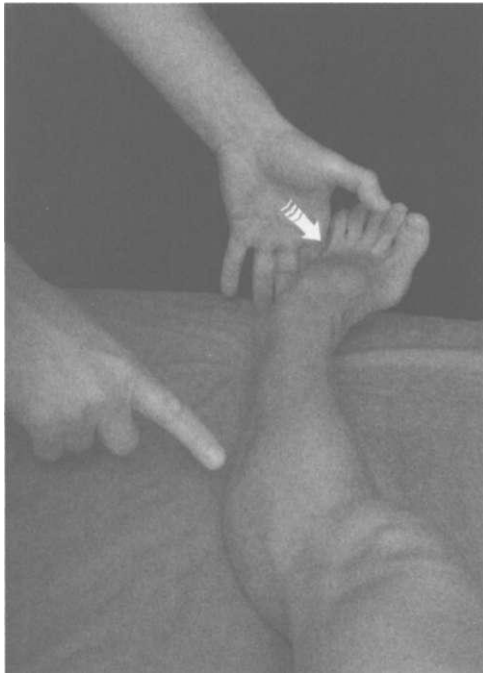
Brevis—Lower two-thirds of shaft of fibula and Base of fifth metatarsal

Action: Eversion of foot with plantar-flexion; supports foot arches

Core: Lumbar, thoracic

Antagonist: Foot invertors, ankle dorsiflexors

Synergist: Tensor fascia latae, gluteus medius and minimus, quadratus lumborum, obliques, lateral neck flexors



Resist eversion of foot in a plantarflexed position.

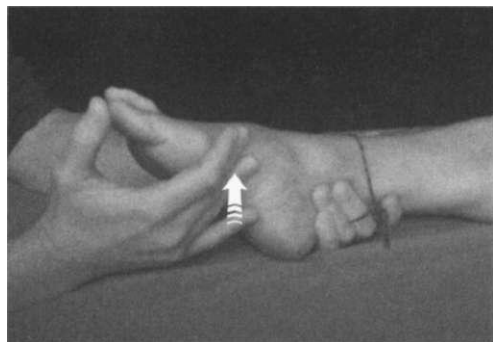
INVERSION OF FOOT

Supine and Prone

Core: *Lumbar*

Antagonist: *Foot evertors*

Synergist: *Medial calf muscles,
medial hamstrings, adductors, psoas*



Place hand on medial arch with other hand stabilizing the ankle. Resist inversion.



EVERSION OF FOOT

Supine and Prone

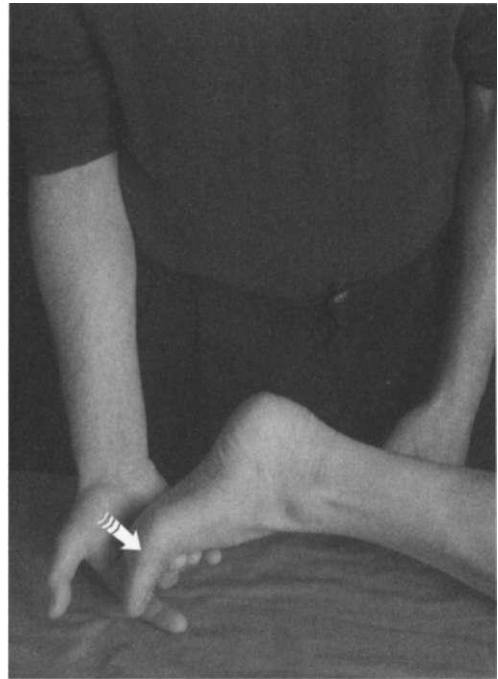
Core: *Lumbar, thoracic*

Antagonist: *Foot invertors*

Synergist: *Tensor fascia latae, gluteus medius and minimus, quadratus lumborum, obliques, lateral neck muscles, neck flexors*



Leg is straight. Place hand on outside of client's foot. Resist eversion.



FLEXOR HALLUCIS LONGUS

Supine

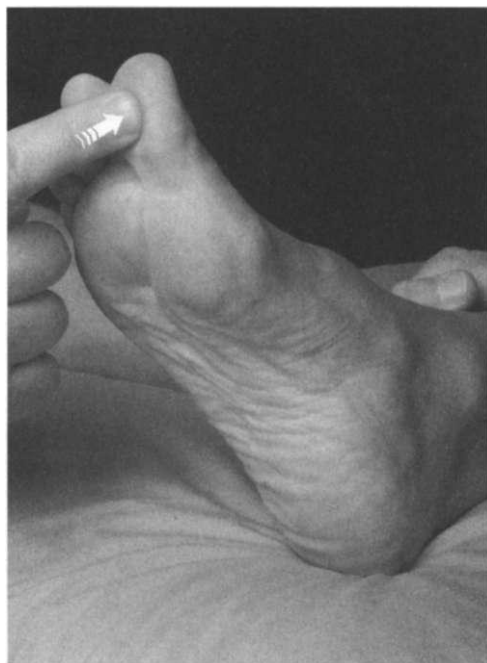
Attachment: Posterior fibula and Distal phalanx of big toe–plantar surface

Action: Flexion of big toe, plantarflexion of ankle

Core: *Lumbar*

Antagonist: *Extensor hallucis longus*

Synergist: *Ankle dorsiflexors, flexor digitorum longus, hamstrings, gluteus maximus, lumbar extensors*



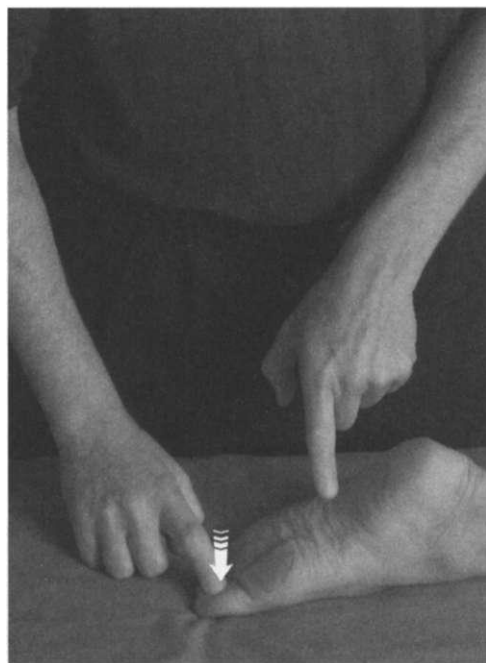
Place index finger on plantar side of client's slightly extended big toe. Resist flexion.



FLEXOR HALLUCIS LONGUS

(continued)

Prone



Leg straight. Place your index finger on big toe.
Resist flexion.

EXTENSOR HALLUCIS LONGUS

Supine and Prone

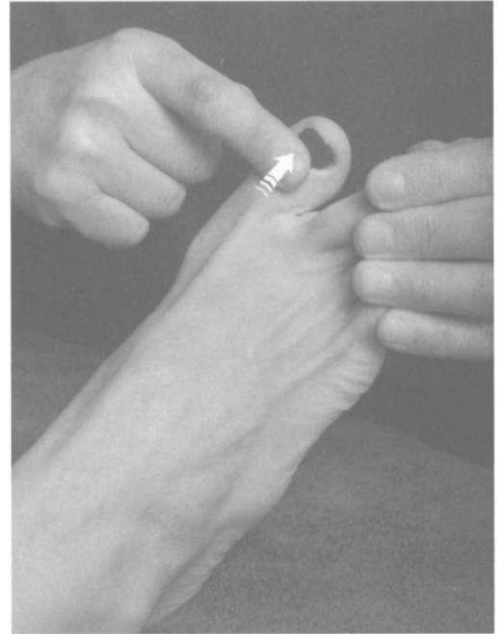
Attachment: Anterior shaft of fibula and Interosseous membrane

Action: Extension of big toe, dorsiflexion of ankle

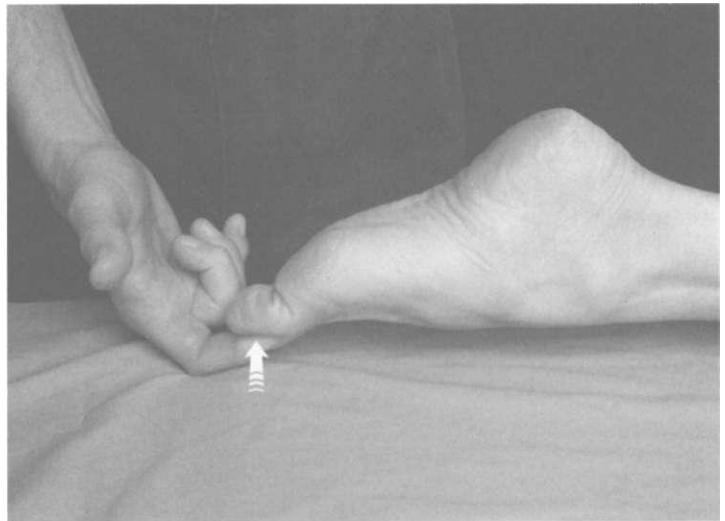
Core: *Lumbar*

Antagonist: *Flexor hallucis longus*

Synergist: *Extensor digitorum longus, tibialis anterior, quadriceps, hip flexors*



Client curls lateral four toes in. Place your index finger on posterior big toe, distal phalanx. Resist extension.



Place your index finger on dorsal surface of client's big toe. Resist extension.

EXTENSOR DIGITORUM

Supine

Attachment: Lateral condyle of tibia, proximal two-thirds of anterior shaft of fibula and Middle and distal phalanges of the four lateral toes

Action: Extension of the four lateral toes at MP joints, assists dorsiflexion of ankle

Core: *Lumbar*

Antagonist: *Flexor digitorum longus, ankle plantarflexors*

Synergist: *Ankle dorsiflexors, quadriceps, iliopsoas*



Place your fingers on the dorsal surfaces of the four lateral toes, slightly flexed. Resist extension.

****For prone, reverse supine test.**

FLEXOR DIGITORUM LONGUS

Supine and Prone

Attachment: Posterior tibia and Distal phalanges of the four lateral toes (plantar surface)

Action: Flexion of the four lateral toes, plantarflexion of ankle

Core: *Lumbar*

Antagonist: *Extensor digitorum longus*

Synergist: *Flexor hallucis longus, ankle plantarflexors, hamstrings, gluteus maximus, lumbar extensors*



Place index finger perpendicularly across the four lateral toes. Resist flexion.

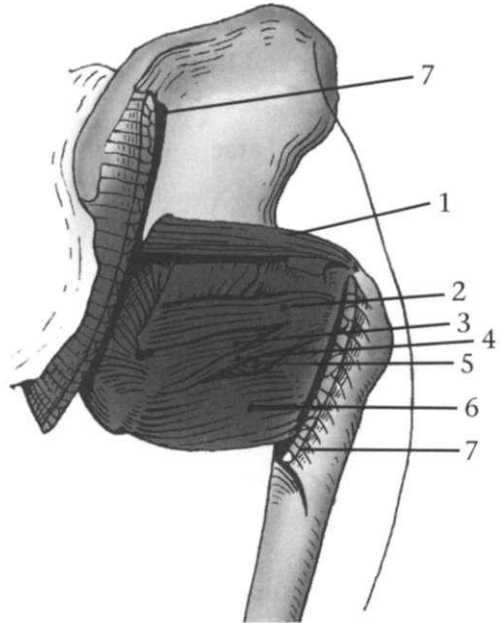


Place your fingers on the plantar surfaces of the four lateral toes. Resist flexion.

■ *Muscle Group Actions of the Lower Extremities*

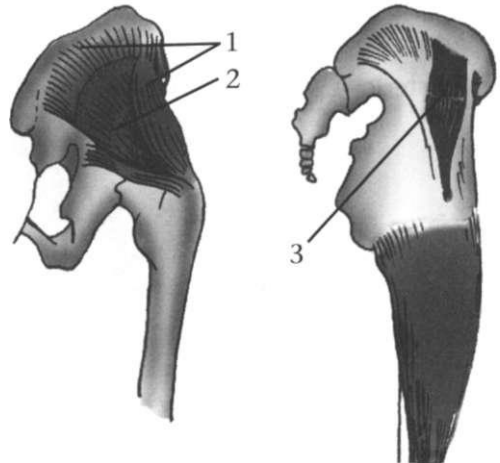
LATERAL (EXTERNAL) ROTATORS OF THE HIP

1. Piriformis
2. Gemellus Superior
3. Obturator Internus
4. Gemellus Inferior
5. Obturator Externus
6. Quadratus Femoris
7. Gluteus Maximus (cut away)
8. Sartorius (not shown)



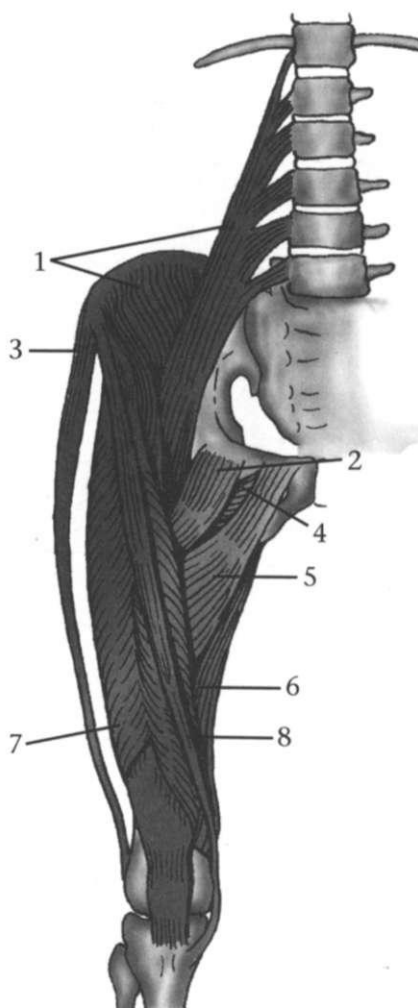
MEDIAL (INTERNAL) ROTATORS OF THE HIP

1. Gluteus Medius
2. Gluteus Minimus
3. Tensor Fascia Latae
4. Adductor Magnus, anterior head (not shown)



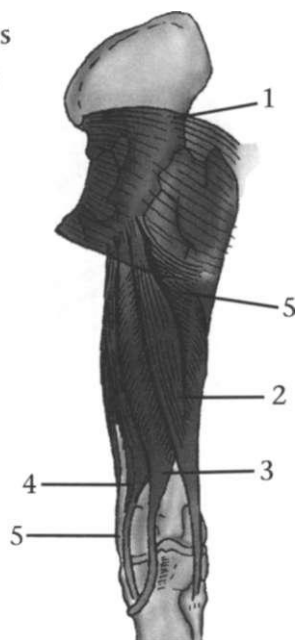
FLEXORS OF THE HIP

1. Psoas Major and Iliacus
2. Pectineus
3. Tensor Fascia Latae
4. Adductor Brevis
5. Adductor Longus
6. Adductor Magnus (anterior head)
7. Rectus Femoris
8. Sartorius



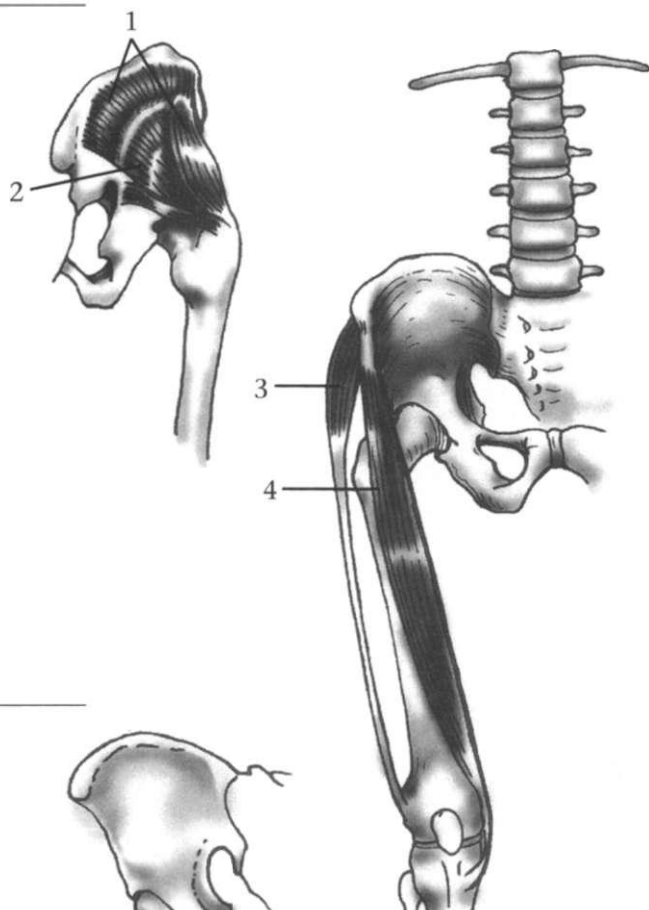
EXTENSORS OF THE HIP

1. Gluteus Maximus
2. Biceps Femoris (long head)
3. Semitendinosus
4. Semimembranosus
5. Adductor Magnus (posterior head)



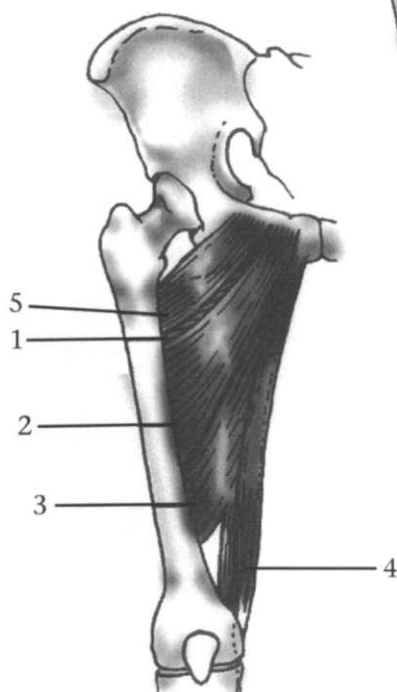
ABDUCTORS OF THE HIP

1. Gluteus Medius
2. Gluteus Minimus
3. Tensor Fascia Latae
4. Sartorius



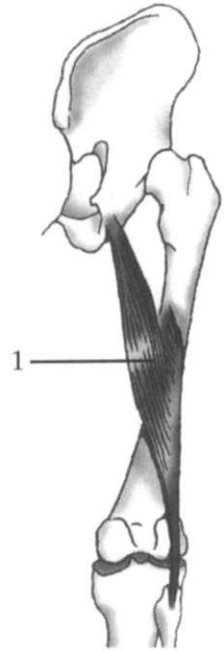
ADDUCTORS OF THE HIP

1. Adductor Brevis
2. Adductor Longus
3. Adductor Magnus
4. Gracilis
5. Pectineus



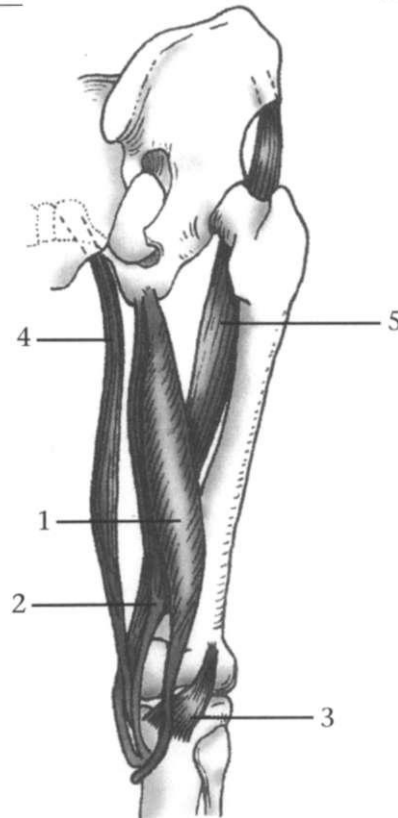
LATERAL (EXTERNAL) ROTATOR OF THE KNEE

1. Biceps Femoris



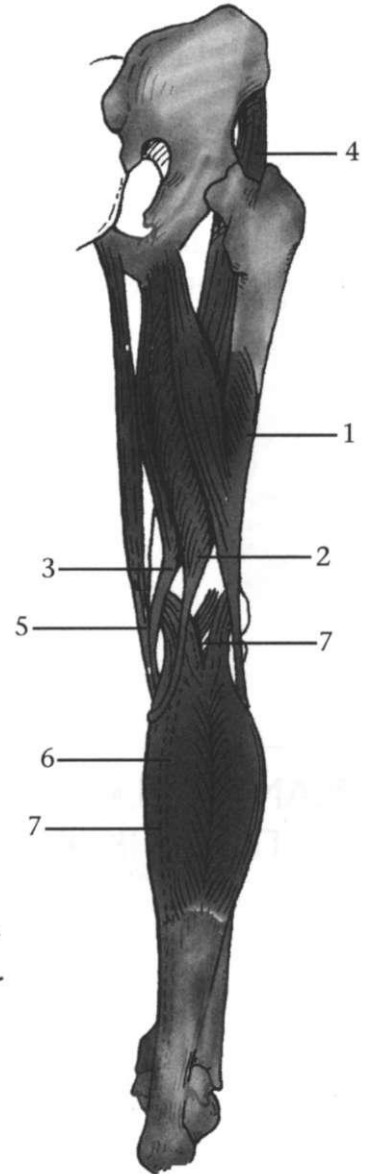
MEDIAL (INTERNAL) ROTATORS OF THE KNEE

1. Semitendinosus
2. Semimembranosus
3. Popliteus
4. Gracilis
5. Sartorius



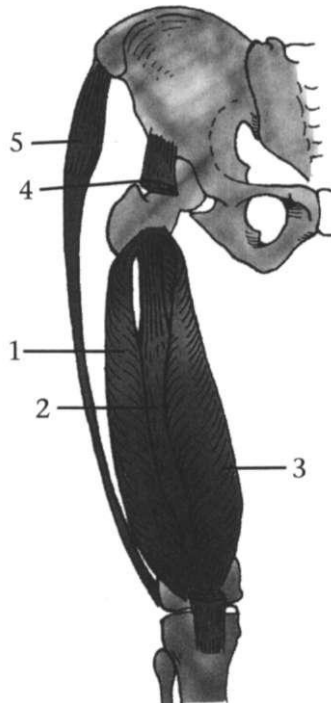
FLEXORS OF THE KNEE

1. Biceps Femoris
2. Semitendinosus
3. Semimembranosus
4. Sartorius
5. Gracilis
6. Gastrocnemius
7. Popliteus



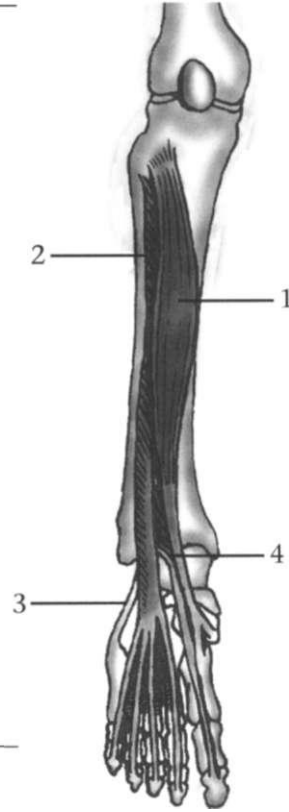
EXTENSORS OF THE KNEE

1. Vastus Lateralis
2. Vastus Intermedius
3. Vastus Medialis
4. Rectus Femoris
5. Tensor Fascia Latae



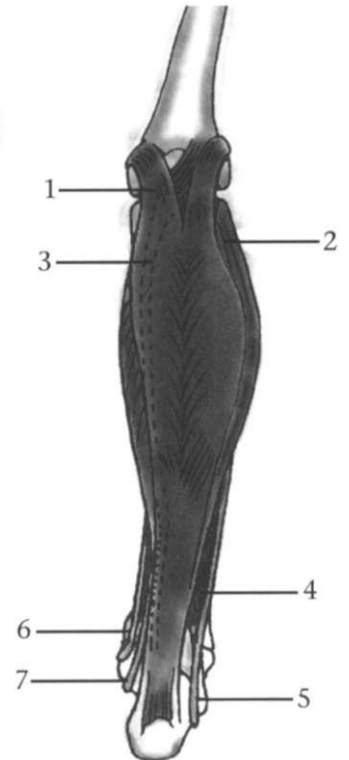
DORSIFLEXORS OF THE ANKLE

1. Tibialis Anterior
2. Extensor Digitorum Longus
3. Peroneus Tertius
4. Extensor Hallucis Longus



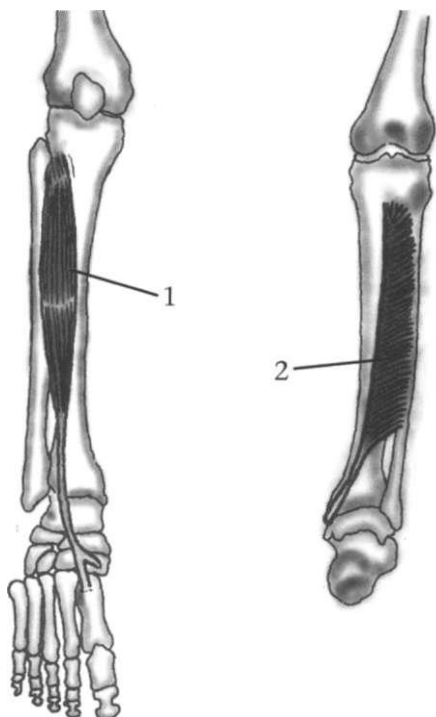
PLANTARFLEXORS OF THE ANKLE

1. Gastrocnemius
2. Soleus
3. Plantaris
4. Peroneus Longus
5. Peroneus Brevis
6. Tibialis Posterior
7. Flexor Hallucis Longus
8. Flexor Digitorum Longus
(not shown)



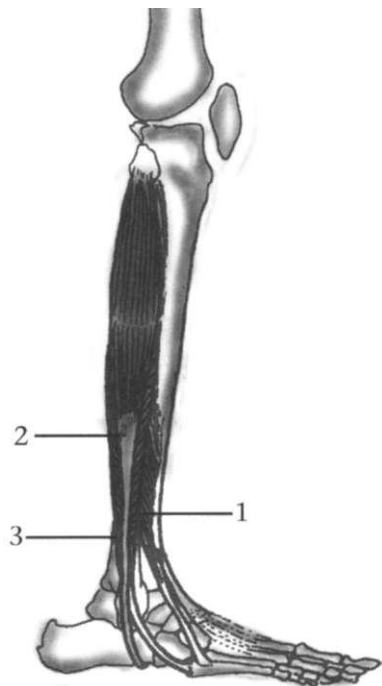
INVERTORS OF THE FOOT

1. Tibialis Anterior
2. Tibialis Posterior



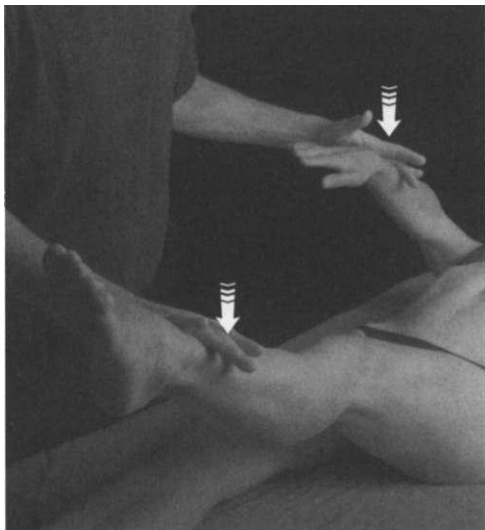
EVERTORS OF THE FOOT

1. Peroneus Tertius
2. Peroneus Longus
3. Peroneus Brevis



V. Miscellaneous Tests

FORWARD GAIT



Resist the client's effort to raise the opposite straight arm and leg. This tests the muscles of walking for integrated movement. For muscles that test weak, work the opposite line to strengthen muscles of the opposite limb.

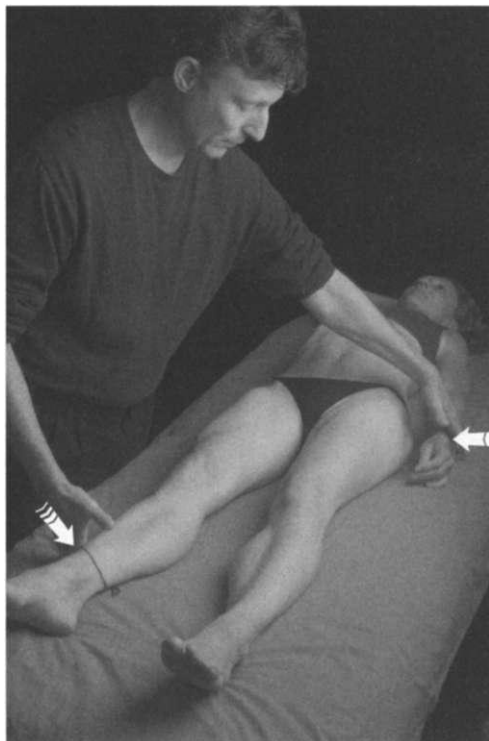
***Do the opposite of these instructions to test for backward gait.*

LATERAL MOVEMENT



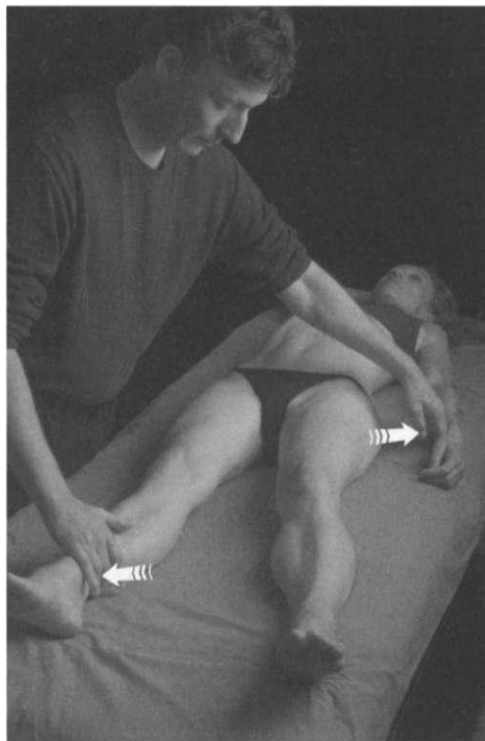
Resist adduction of the client's opposite leg while resisting arm abducting. This assesses the integrity of lateral movement. It can be done the opposite way as well. Follow the same corrective procedure in forward gait.

ABDUCTION INTEGRATION



Resist opposite arm abducting while resisting leg abducting. This assesses body's ability to abduct limbs simultaneously (jumping jack). Follow the same corrective procedure in forward gait.

ADDUCTION INTEGRATION



Resist opposite arm adducting while resisting leg adducting. This assesses the body's ability to simultaneously adduct (jumping jack). Follow the same corrective procedure in forward gait.

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About the Author

David Weinstock discovered his passion for alternative medicine as a premedical student at Johns Hopkins University. He later traveled throughout Central and South America learning from native healers. Weinstock is fluent in both Spanish and Portuguese. In 1979 he completed a thousand-hour program at the New Mexico School of Natural Therapeutics. He began his teaching career as well as a private practice in Albuquerque, New Mexico.

Weinstock codeveloped NeuroKinetic Therapy in 1987. He uses this technique to treat neck and back injuries, temporomandibular joint disorder (TMJ), and carpal tunnel syndrome. In 1986 he cofounded Alive and Well, Institute of Conscious Bodywork, where he taught until 2007. He currently works and lives in Corte Madera, California, with his wife, Rose, and daughter, Selena. For more information, you may visit his Web site at www.neurokinetictherapy.com.