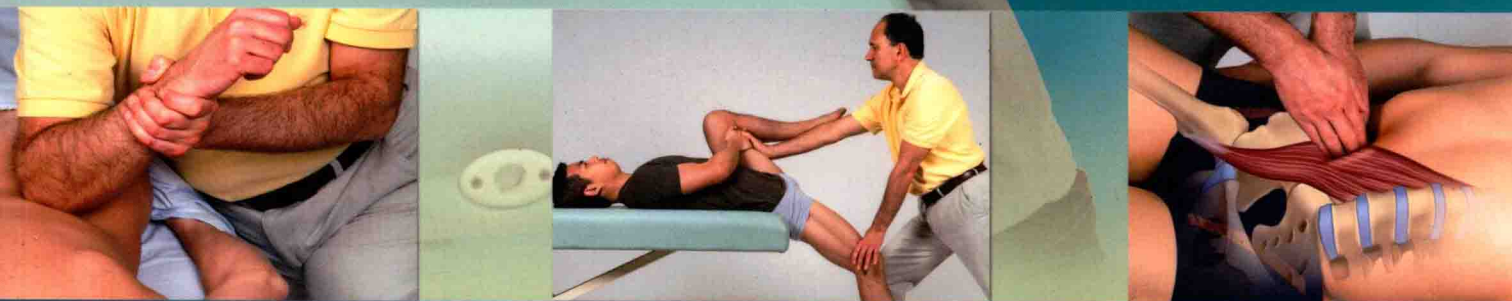


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# Manual Therapy for the **Low Back and Pelvis**

A Clinical  
Orthopedic  
Approach



**Joseph E. Muscolino**

# Manual Therapy for the Low Back and Pelvis A Clinical Orthopedic Approach

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Illustrations: Lightbox Visuals, Inc.  
Photographs: Yanik Chauvin Photography  
Compositor: Absolute Service, Inc.

First Edition

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Figure 6-9A&B courtesy of Joseph E. Muscolino

351 West Camden Street  
Baltimore, MD 21201

Two Commerce Square  
2001 Market Street  
Philadelphia, PA 19103

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9 8 7 6 5 4 3 2 1

#### Library of Congress Cataloging-in-Publication Data

Muscolino, Joseph E., author.

Manual therapy for the low back and pelvis : a clinical orthopedic approach / Joseph E. Muscolino. — First edition.

p. ; cm.

Includes bibliographical references and index.

ISBN 978-1-58255-880-6 (alk. paper)

I. Title.

[DNLM: 1. Musculoskeletal Diseases—diagnosis. 2. Musculoskeletal Diseases—therapy. 3. Low Back Pain—therapy. 4. Lumbosacral Region. 5. Manipulation, Orthopedic—methods. 6. Massage—methods. 7. Pelvic Pain—therapy. 8. Pelvis. WE 750]

RD771.B217

617.5'6406—dc23

2013049086

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*This book is lovingly dedicated  
to my son, Joseph C. Muscolino*

# REVIEWS

The author and the Wolters Kluwer Health team would like to extend our sincere thanks to those who offered feedback and reviews throughout the development of this book:

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# PREFACE

As the field of massage therapy has gained greater acceptance, its role within the health field has increased commensurately. For this reason, there is a growing need for treatment techniques that are oriented toward clinical orthopedic rehabilitation of clients who present with musculoskeletal conditions. The purpose of this book is to present an array of these treatment techniques that can be used by the massage therapist and other manual therapists.

*Manual Therapy for the Low Back and Pelvis: A Clinical Orthopedic Approach* is designed to be used by the practicing therapist who wants to learn techniques that likely were not taught during his or her training at school. This book is also designed to comfortably fit into the curriculum of a massage therapy or other manual or movement therapy school that desires to teach these techniques, whether it is within the core curriculum or within the continuing education offerings. Note that what is and what is not within the scope of practice of a massage therapist or other manual therapist varies from state to state, and occasionally varies from one town, city, county, or province to another. It is the responsibility of the practicing therapist to make sure that he or she is practicing legally and employing treatment techniques that are within the scope of his or her license or certification.

## ORGANIZATION

The content of this book is divided into three parts.

- Part 1 addresses the foundational information necessary to be able to understand the client's low back/pelvis condition, assess it, and determine the appropriate options.
- Part 2 covers the actual low back/pelvis treatment techniques. Each chapter covers a specific technique.
- Part 3 covers the use of hydrotherapy and postural self-care for the client and therapist. Part 3 chapters are available online at [thepoint.lww.com/MuscolinoLowBack](http://thepoint.lww.com/MuscolinoLowBack).

Every effort has been made to make this book as user friendly and as accessible as possible. Each chapter contains a simplified outline, learning objectives, and a list of key terms. Technique chapters located in Part 2 also contain a list of the treatment routines that will be covered in that chapter, along with case studies, Think-It-Through questions, precautions, and practical applications. Furthermore, every chapter concludes with a brief review of the chapter's content and provides 20 chapter review questions online.

### Part 1: Anatomy, Pathology, and Assessment

Of course, proper treatment can only be applied if the foundational anatomy, physiology, and kinesiology are

first understood. To this end, Chapter 1 provides a review of the anatomy and physiology of the low back and pelvis. This review is just that—a review. It is not meant to replace the entire science curriculum of a massage school training. Rather, it covers the essential elements of the anatomy and physiology of the lumbar spine and sacroiliac joints so that the treatment principals presented in later chapters can be more easily understood, learned, and applied. I recommend that readers begin with this chapter before continuing on to technique chapters.

Applying the proper treatment techniques also requires a clear understanding of the anatomy and physiology of the pathologic condition that the client is experiencing. Therefore, Chapters 2 and 3 discuss the most common musculoskeletal conditions that affect the lumbar spine and pelvis. Chapter 2 addresses the presentation and causes of these conditions; Chapter 3 addresses their assessment.

### Part 2: Treatment Techniques

There are a number of therapeutic techniques that are available to the practicing massage and manual therapist. Principal among these is Swedish-based massage. Although any Swedish-based massage application is therapeutic in nature due to its effect on the parasympathetic branch of the nervous system and on the circulatory system, deeper tissue techniques often offer the advantage of further clinical benefit. Chapter 4 of this book offers technique strategies for working the musculature of the low back and pelvis more efficiently with less effort. I like to think of it as showing you how to work smart, not hard. Due to the unique anatomy of the musculature of the abdominal wall, Chapter 5 specifically addresses massage treatment of this region.

However, massage is not the only therapeutic tool available to the massage and manual therapist. Stretching is another effective treatment option. Unfortunately, stretching is often only lightly covered in massage therapy curricula and therefore underutilized by most practicing massage therapists. Chapters 6 through 9 of this book review basic stretching and present a number of advanced stretching techniques for the lumbar spine and pelvis that can be used effectively for the treatment of our clients.

Joint mobilization is even more underutilized than stretching within the scope of practice of most massage therapists. When performed appropriately and with skill, joint mobilization can be an extremely powerful tool for the treatment of lumbar spine and sacroiliac joint problems. However, it must be done carefully and judiciously. Chapter 10 of this book presents a number of joint mobilization techniques that can be used by massage therapists for the safe and effective treatment of their client's lumbar spinal and sacroiliac joint problems.

### Part 3: Self-Care for the Client and Therapist

The critical subject of self-care for the client and for the therapist is covered in two additional chapters, available online at [thepoint.lww.com/MuscolinoLowBack](http://thepoint.lww.com/MuscolinoLowBack). Online Chapter 11 discusses the use of hydrotherapy and proper instruction to our clients for home care. Hydrotherapy, or using water to transmit heat and/or cold to the client, can be a very helpful adjunct to our treatment sessions. This chapter also looks at knowing when to use heat versus cold, as well as the specific application of these various therapies. And, given that no client treatment plan strategy is complete without the proper instruction to the client on what he or she can do at home between massage sessions, self-care is also discussed.

Online Chapter 12 addresses self-care for the therapist. Massage and other manual therapies can be physically demanding, and maintaining our bodies in good physical shape is of paramount importance. To that end, Chapter 12 offers self-care exercises for the therapist to perform to stay strong and healthy and help assure career longevity.

### ANCILLARIES

Given the dynamic nature of the treatment techniques presented in this book, depending on still photos and text description alone is difficult. For this reason, *Manual Therapy for the Low Back and Pelvis: A Clinical Orthopedic Approach* also provides access to a companion website at [thepoint.lww.com/MuscolinoLowBack](http://thepoint.lww.com/MuscolinoLowBack), with videos that demonstrate many of the assessment and treatment techniques covered in this book being performed on clients, along with a complete image bank.

In addition to the videos and to the self-care chapters described earlier, this book's companion website provides chapter review questions and answers, and answers to the case studies that begin in Chapter 3.

As massage and other forms of manual and movement therapy take their rightful place within the world of complementary and alternative medicine, the need for increased education grows. This book offers a number of treatment techniques that empower manual therapists to be able to better work with and help clients who present with musculoskeletal conditions. Along with *its companion* website, *Manual Therapy for the Low Back and Pelvis: A Clinical Orthopedic Approach* will be an invaluable asset to your practice.



# ACKNOWLEDGMENTS

Because my name is the only name on the front cover of this book, the reader could incorrectly assume that I am the only person responsible for its creation. This is far from the truth. Many people helped create the book that you are holding. This is my opportunity to both directly thank them and to acknowledge them to you, the readers.

Much of the beauty of this book lies in its artwork. I am lucky to have worked for many years with an amazing team. Yanik Chauvin is the principal photographer and videographer. His eye for the best angle to portray motion and the best lighting to focus the viewer is unsurpassed. He is also one of the most enjoyable people to work with! The principal illustrator is Giovanni Rimasti of LightBox Visuals. Under the extremely competent direction of Jodie Bernard (owner of LightBox Visuals), he provided clear and crisply drawn illustrations that ably convey to the reader both the underlying anatomy and the motion of the body. And of course, I was fortunate to have a wonderful group of models: Hyesun Bowman, Vaughn Bowman, Victoria Caligiuri, Simona Cipriani, Emilie Miller, Joseph C. Muscolino, Maryanne Peterson, Jintina Sundarabhaya, and Kei Tsuruharatani. Thank you to all for contributing to the beauty of this book!

Editing and production are especially invisible parts of the creation of a book. But anyone who has ever had the

opportunity to see the first draft of a book and compare it to its final publication knows how invaluable editing and production are. Many thanks to everyone on the Wolters Kluwer Health team who helped to create this book and bring it to fruition: Eve Malakoff-Klein, who supervised the project; Jonathan Joyce, acquisitions editor; David Orzechowski and Harold Medina who coordinated the production; Linda Francis, who handled development and manuscript preparation; and Jen Clements, who assisted with the art.

Particular thanks are owed to Brett M. Carr, MS, DC, for writing the online chapter on *Self-Care for the Therapist* (Chapter 12). His expertise was invaluable and helped to round out and strengthen the content of this book.

As usual, a special thank you to a former student, now instructor, William Courtland, who first spurred me to become a textbook author with the simple words: "You should write a book."

And, finally, most important of all, thank you to my entire family, especially my wife, Simona Cipriani, for all of your love, understanding, support, and encouragement. You make it all worthwhile!

Joseph E. Muscolino



## ABOUT THE AUTHOR

**Joseph E. Muscolino, BA, DC**, has been teaching core curriculum and continuing education musculoskeletal anatomy, physiology, kinesiology, assessment, and treatment courses to manual and movement therapists for more than 25 years. He was an instructor at the Connecticut Center for Massage Therapy from 1986 to 2010 and is presently an adjunct professor at Purchase College, State University of New York (SUNY).

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Dr. Muscolino teaches continuing education (CE) workshops around the globe on such topics as body mechanics, deep tissue massage, stretching, advanced stretching, joint mobilization, muscle palpation, joint motion palpation, orthopedic assessment, musculoskeletal pathologic conditions, kinesiology, and cadaver workshops. Through The Art and Science of Kinesiology, Dr. Muscolino offers a Certification in Clinical Orthopedic Manual Therapy (COMT). He also runs instructor in-services for kinesiology and hands-on treatment instructors. He is an approved provider of continuing education; credit is available through the National Certification Board for Therapeutic Massage and Bodywork (NCBTMB) toward certification renewal for massage therapists and bodyworkers.



Dr. Muscolino holds a Bachelor of Arts in Biology from SUNY at Binghamton, Harpur College, and a Doctor of Chiropractic from Western States Chiropractic College in Portland, Oregon. He has been in private practice in Connecticut for more than 28 years and incorporates soft tissue work into his chiropractic practice for all his patients.

For further information regarding *Manual Therapy for the Low Back and Pelvis: A Clinical Orthopedic Approach*, please visit [thepoint.lww.com/MuscolinoLowBack](http://thepoint.lww.com/MuscolinoLowBack). For information on Dr. Muscolino's other publications, DVDs, and workshops, or to contact Dr. Muscolino directly, please visit his website, [www.learnmuscles.com](http://www.learnmuscles.com), or follow him on Facebook at The Art and Science of Kinesiology.

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# Anatomy, Pathology, and Assessment

## CHAPTER

## 1

## Anatomy and Physiology Review

### CHAPTER OUTLINE

Introduction	2	Musculature of the Lumbar Spine and Pelvis	12
The Lumbar Spine and Pelvis	2	Ligaments of the Lumbar Spine and Pelvis	31
Lumbar Spinal Joints and Pelvic Joints	4	Precautions	35
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### OBJECTIVES

*After completing this chapter, the student should be able to:*

1. Describe the structure of the lumbar spine and pelvis.
2. Discuss the importance and implications of the lumbar spinous processes to assessment and treatment.
3. Discuss the importance and implications of the posterior superior iliac spine (PSIS) and anterior superior iliac spine (ASIS) to assessment and treatment.
4. Describe the structure and function of the lumbar spinal, sacroiliac, and hip joints.
5. Describe the motions of the lumbar spinal, sacroiliac, and hip joints.
6. List the attachments and actions of the muscles of the lumbar spine and pelvis.
7. Classify the muscles of the lumbar spine and hip joints into their major structural and functional groups.
8. Explain why knowing the actions of a muscle can facilitate palpating and stretching it.
9. List and describe the structure and function of the ligaments of the lumbar spine and pelvis.
10. Explain how ligaments and antagonist muscles are similar in function.
11. Describe the major precautions and contraindications when working on the low back and pelvis.
12. Define each key term in this chapter.

### KEY TERMS

abdominal aorta  
abdominal aponeurosis  
annulus fibrosus  
anterior longitudinal ligament  
anterior sacroiliac ligaments  
anterior superior iliac spine (ASIS)  
cardinal planes  
central canal  
circumduction  
closed chain  
coccyx  
contralateral muscles

contralateral rotation  
counternutation  
disc joint  
facet joints  
femoral artery  
femoral nerve  
femoral triangle  
femoral vein  
femoropelvic rhythm  
glide  
hyperlordotic  
hypolordotic  
iliac crest

iliofemoral ligament  
iliolumbar ligaments  
ilium  
interspinous ligaments  
intertransverse ligaments  
intervertebral foramina  
intrapelvic motion  
ipsilateral rotation  
ischiofemoral ligament  
ischium  
lamina  
laminar groove  
ligamentum flavum

ligamentum teres  
lordotic curve (lordosis)  
lumbar spine  
lumbosacral joint  
nucleus pulposus  
nutation  
open chain  
pars interarticularis  
pelvic bones  
posterior longitudinal ligament  
posterior sacroiliac ligaments  
posterior superior iliac spine (PSIS)

pubis  
pubofemoral ligament  
reverse actions  
sacral base  
sacral tubercles

sacroiliac joint (SIJ)  
sacrospinous ligament  
sacrotuberous ligament  
sacrum  
sciatic nerve

segmental joint level  
spinous process  
supraspinous ligament  
thoracolumbar fascia  
translation

vertebral foramina  
zona orbicularis  
zygapophyseal joints (Z joints)

## INTRODUCTION

This chapter is an overview of the anatomy and physiology of the low back and pelvis. Having a solid foundation in the structure and function of a region allows you to understand and better apply treatment techniques to that region. For more complete coverage of the structure and function of the low back and pelvis, anatomy, physiology, and kinesiology textbooks should be consulted.

## THE LUMBAR SPINE AND PELVIS

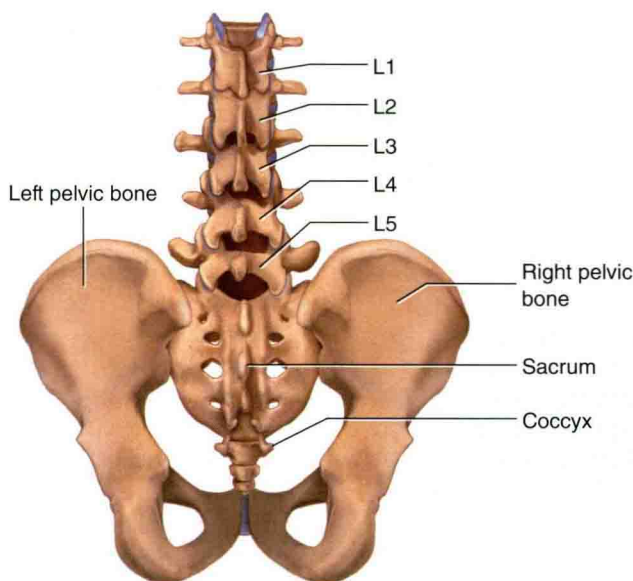
The low back is defined by the **lumbar spine**, and the pelvis is defined by the bones of the pelvic girdle. The lumbar spine is composed of five vertebrae, named L1 to L5 from superior to inferior. The pelvis is composed of the two pelvic bones and the sacrum and coccyx (the pelvic bones are also known as the coxal, innominate, or hip bones) (Fig. 1-1).

### Lumbar Spine

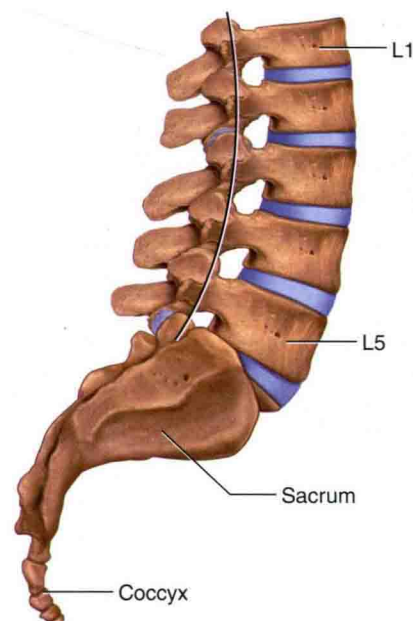
From a lateral view, the healthy lumbar spine can be seen to have a **lordotic curve (lordosis)**, which is defined as being concave posteriorly and convex anteriorly (Fig. 1-2). (The terms *lordotic* and *lordosis* are often used to denote an

excessive and unhealthy lordotic curve. However, these terms are also used to refer to the healthy and normal curve of the low back and neck.) All lumbar vertebrae have a **spinous process** that extends posteriorly and can usually be palpated. How easy or difficult it is to palpate the lumbar spinous processes depends largely on the degree of the client's lordotic curve. Because the lumbar curve is lordotic, the spinous processes are recessed and not as superficial for palpation as are the spinous processes of the thoracic spine. However, some clients' lumbar curves are decreased or even straight; a decreased or absent lordotic curve is termed **hypolordotic**, making palpation of the spinous processes much easier. If, on the other hand, the client's lumbar curve is excessive, it is termed **hyperlordotic**; the spinous processes of a hyperlordotic lumbar spine are more difficult to palpate. Other prominent lumbar bony landmarks are the **lamina**, **laminar groove**, **mammillary process**, **transverse process**, **facets**, **pars interarticularis**, and **vertebral body**. The spinal cord travels through the **central canal** formed by the **vertebral foramina** (singular: foramen), and the lumbar spinal nerves travel through the **intervertebral foramina** between adjacent vertebrae (Fig. 1-3).

Because of the lordotic curve and the thick musculature that overlies the lumbar spine, the only easily palpable bony landmark is the spinous process. Therefore, the spinous processes (and laminae) are used when contacting the lumbar spine for motion palpation assessment and joint mobilization treatment.

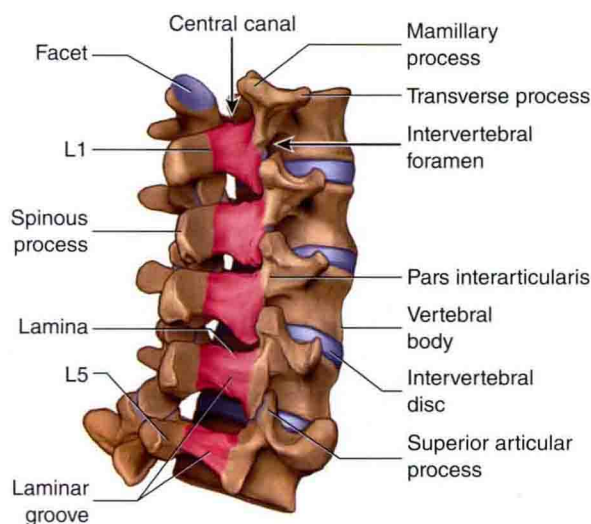


**Figure 1-1** Posterior view of the lumbar spine and pelvis. The lumbar spine is composed of five vertebrae, named L1 to L5 from superior to inferior. The pelvis is composed of the two pelvic bones and the sacrum and coccyx.

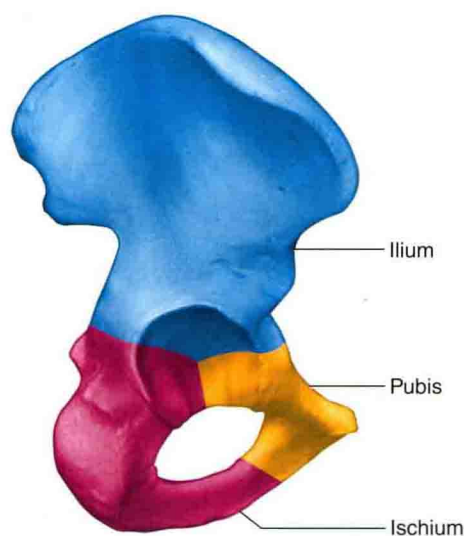


**Figure 1-2** Right lateral view of the lumbar spine. The lumbar spine's curve is described as lordotic, with its concavity facing posteriorly and its convexity facing anteriorly.





**Figure 1-3** Right posterolateral view of the lumbar spine. Prominent bony landmarks are labeled.

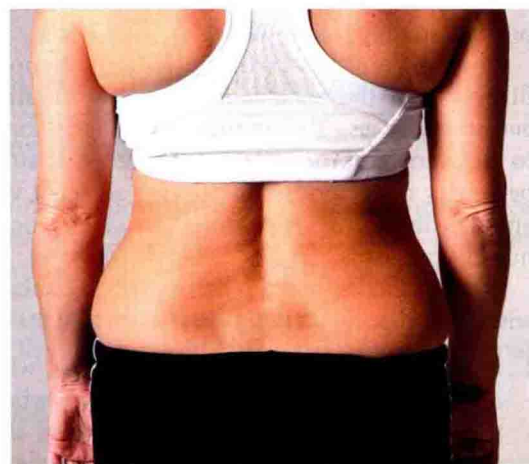
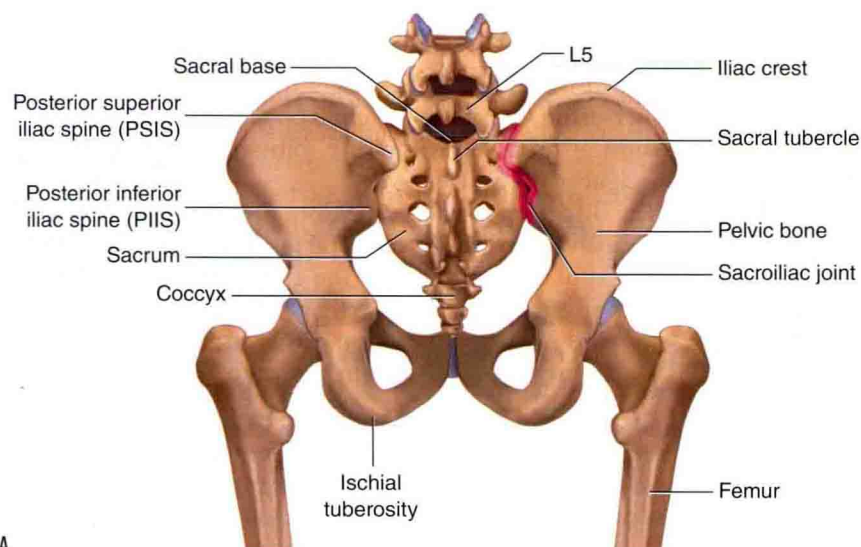


**Figure 1-4** Lateral view of the right pelvic bone. The ilium, ischium, and pubis have been colored to discern their borders: The ilium is blue, the ischium is pink, and the pubis is yellow.

## Pelvic Girdle

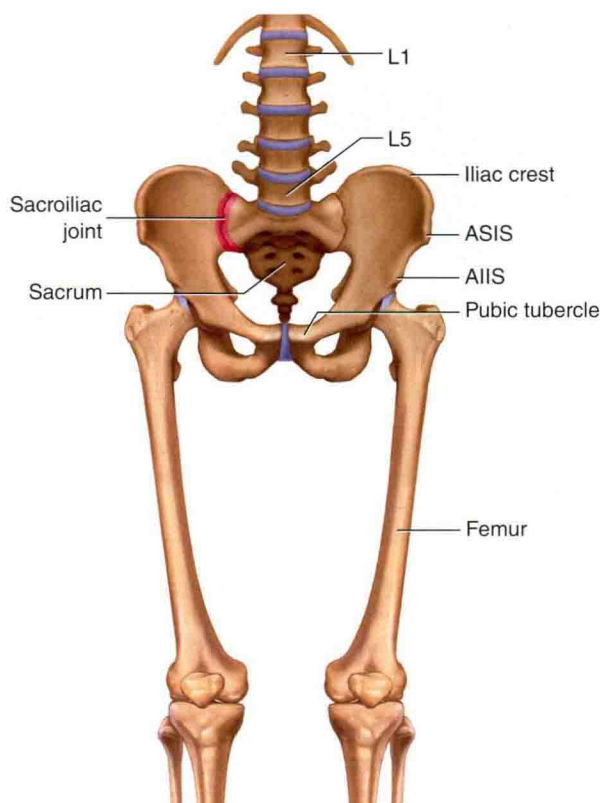
The bones of the pelvic girdle are the two **pelvic bones** and the **sacrum** and **coccyx** (see Fig. 1-1). Each pelvic bone is composed of three bones—the **ilium**, **ischium**, and **pubis**—that fuse together embryologically (Fig. 1-4). The sacrum is composed of five vertebrae that did not fully form and fused together to create a triangular-shaped bone. The triangular-shaped sacrum is upside down, with the **sacral base** located superiorly and the apex located inferiorly. Between the sacrum and iliac portion of the pelvic bone on each side of the body is a **sacroiliac joint (SIJ)**. The coccyx, usually considered to be the evolutionary remnant of a tail, is composed of four poorly formed vertebral segments that often fuse as a person ages. There are a number of important bony landmarks of

the pelvis. On the posterior side are the **posterior superior iliac spine (PSIS)**, posterior inferior iliac spine (PIIS), greater sciatic notch, ischial tuberosity, ischial spine, and **sacral tubercles** (Fig. 1-5A). A dimple in the skin of the client can usually be seen where the skin falls in on the medial side of the PSIS (Fig. 1-5B). Locating this dimple is helpful when palpating for the PSIS. On the anterior side are the **anterior superior iliac spine (ASIS)**, anterior inferior iliac spine (AIIS), and pubic tubercle (Fig. 1-6). The **iliac crest** is located laterally between the PSIS and ASIS (see Figs. 1-5A and 1-6). The PSIS and ASIS are easily palpable and important contacts for stabilization of the pelvis when stretching the client. The PSIS and sacral tubercles are also important when performing motion palpation assessment of the SIJs of the pelvis,



**Figure 1-5** Posterior views of the lumbar spine and pelvis. (A) View of bones and bony landmarks. (B) Dimples are usually visible immediately medial to the PSISs.





**Figure 1-6** Anterior view of the lumbar spine and pelvis. The prominent bones and bony landmarks have been labeled. *AIIS*, anterior inferior iliac spine; *ASIS*, anterior superior iliac spine.

and the PSIS is an important contact point when mobilizing the SIJ.

## LUMBAR SPINAL JOINTS AND PELVIC JOINTS

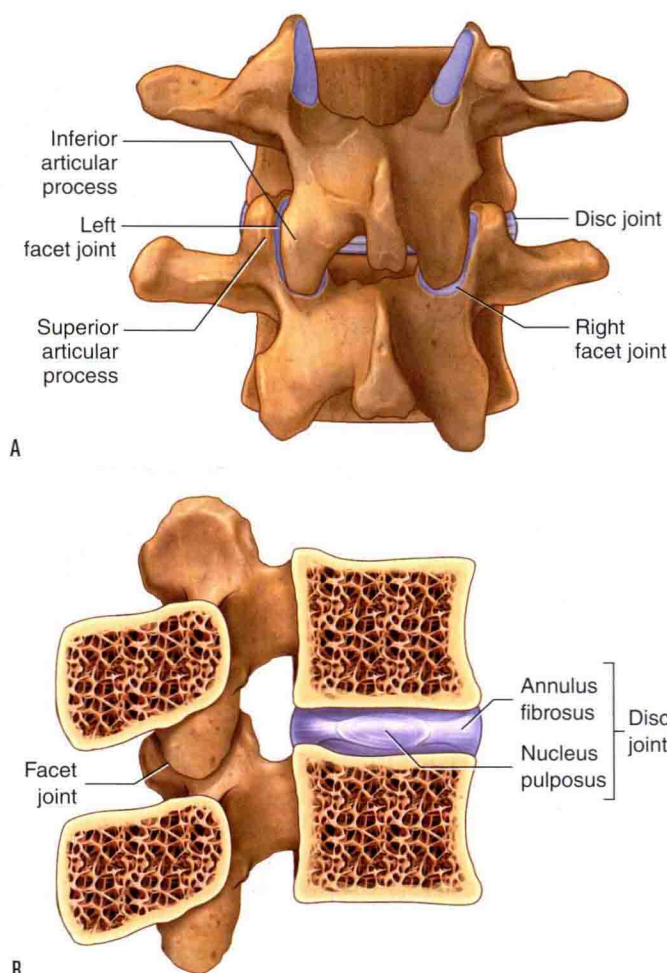
### Lumbar Spinal Joints

In the lumbar spine, three joints are located between each two adjacent vertebrae: one **disc joint** (intervertebral disc joint) and two paired (left and right) **facet joints**. The disc joint is located anteriorly, and the facet joints are located posterolaterally (Fig. 1-7A).

The disc joint is a cartilaginous joint composed of outer fibers called the **annulus fibrosus** that encircle the inner **nucleus pulposus**. The annulus fibrosus is composed of 10 to 20 layers of fibrocartilaginous fibers that attach along the periphery of the bodies of the two adjacent vertebrae. The annular fibers provide a strong and stable enclosure for the nucleus pulposus.

The nucleus pulposus is a thick jellylike substance located within the disc joint (Fig. 1-7B). It has two main functions:

1. It holds the two vertebral bodies apart, which not only creates a larger intervertebral foramen where the spinal nerve enters and exits the spine but also allows the disc joint a greater range of motion.
2. It provides cushioning to the spine.

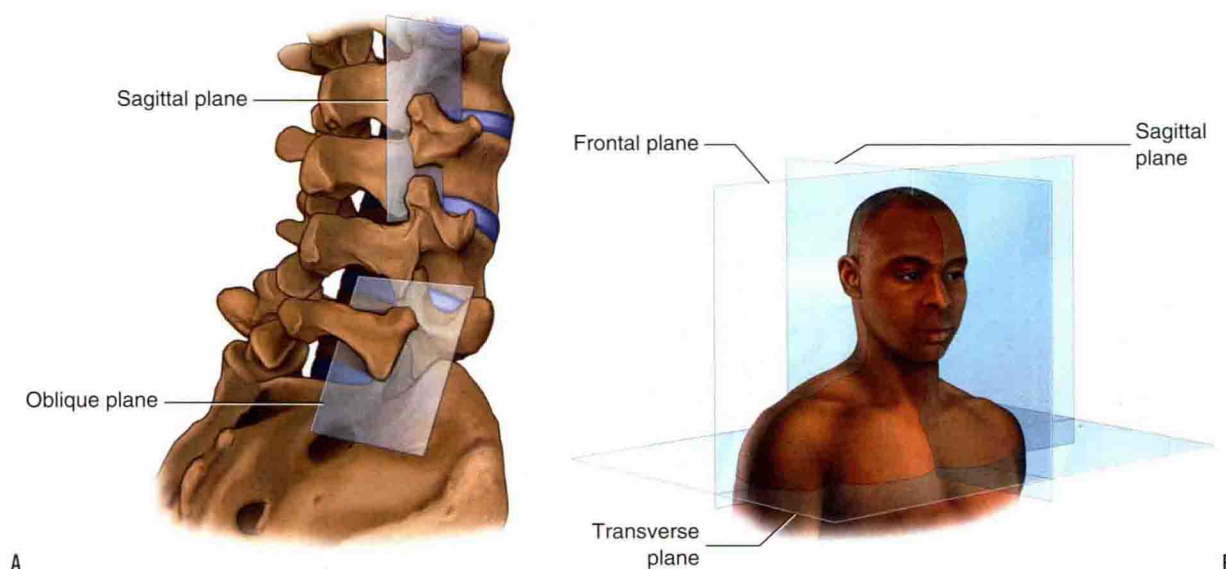


**Figure 1-7** The disc and facet joints of the spine. (A) Posterior view. The disc joint is located anteriorly; the paired facet joints are located posterolaterally. (B) Right lateral view of a sagittal plane cross section. The disc joint is composed of the outer annulus fibrosus fibers and an inner nucleus pulposus. (Courtesy of Joseph E. Muscolino.)

As a whole, the disc joint itself has three major functions:

1. The disc joint bears the weight of the body above it. The increasing size of the vertebral bodies and discs descending the spine helps the disc joints bear the increasing weight of the body above it.
2. The disc joint's thickness allows for a great deal of motion. Overall, the intervertebral discs comprise 25% of the height of the entire spine. The greater the relative height of the discs compared to vertebral body height, the greater the possible range of motion at that region of the spine.
3. The intervertebral discs help to absorb shock.

Each facet joint is a synovial joint that is located between the inferior vertebra's superior articular process and the superior vertebra's inferior articular process (see Fig. 1-7). It is called a facet joint because the joint surface of each of the articular processes has a facet (a smooth flat surface) on it. The scientific name for facet joints is **zygapophyseal joints**,



**Figure 1-8** Plane of the facet joints of the lumbar spine. (A) The plane of the lumbar facets is oriented in the sagittal plane, except for the facet plane of the lumbosacral joint, which is oriented in an oblique plane that is close to the frontal plane. Right posterolateral oblique view. (B) Review of all three cardinal (major) planes of the body. ([B] Reproduced with permission from Muscolino JE. *Advanced Treatment Techniques for the Manual Therapist: Neck*. Baltimore, MD: Lippincott Williams & Wilkins; 2013.)

hence they are also often known as **Z joints**. Facet joints function to guide motion at that segmental joint level of the spine. The term **segmental joint level** refers to a specific joint level of the spine that includes the disc and facet joints at that level. For example, the joint between L3 and L4, known as the L3-L4 joint, is a segmental level; the L4-L5 joint is another segmental level. The joint between L5 and the base of the sacrum is known as the L5-S1 joint, or simply the **lumbosacral joint**. An understanding of the posture of the lumbosacral joint is extremely important toward understanding pelvic tilt posture and its effect on the lumbar lordotic curve.

The disc joint determines how much vertebral motion is possible at a particular segmental level, and the facet joints determine the type of motion (i.e., the direction of motion) that can occur there. In the lumbar spine, the plane of the facets is vertically oriented in the sagittal plane. An exception to this is at the L5-S1 level where the facet plane is oriented in an oblique plane that is very close to the frontal plane (Fig. 1-8A). *Note:* Figure 1-8B is a review of the three cardinal (major) planes of the body. The three **cardinal planes** are the sagittal, frontal (also known as coronal), and transverse. Any plane that is not perfectly sagittal, frontal, or transverse is an oblique plane.

Because of the sagittal plane orientation of the lumbar facets, the lumbar spine moves extremely well in flexion and extension (sagittal plane motions). Because the facets of the lumbosacral joint are oriented approximately within the frontal plane, right and left lateral flexion motions occur more freely at that level. It is important to be aware of the type of motion that each level of the spine allows when performing joint mobilization (discussed in Chapter 10).

## Pelvic Joints

Pelvic joints can be divided into two categories: joints between the pelvis and adjacent body parts and joints located within the pelvis. The lumbosacral joint is located between the pelvis and trunk (more specifically, between the sacrum of the pelvis and L5 of the lumbar spine) (see Fig. 1-2), and the hip joints are located between the pelvis and the thighs (more specifically, the femurs of the thighs) (see Fig. 1-6). Within the pelvis, there are two SIJs and one symphysis pubis joint. Each SIJ is located posteriorly between the sacrum and the iliac portion of the pelvic bone on that side (see Figs. 1-5A and 1-6). The symphysis pubis joint is located anteriorly between the two pubic bone portions of the pelvic bones (see Fig. 1-6).

## MOTIONS OF THE LUMBAR SPINE AND PELVIS

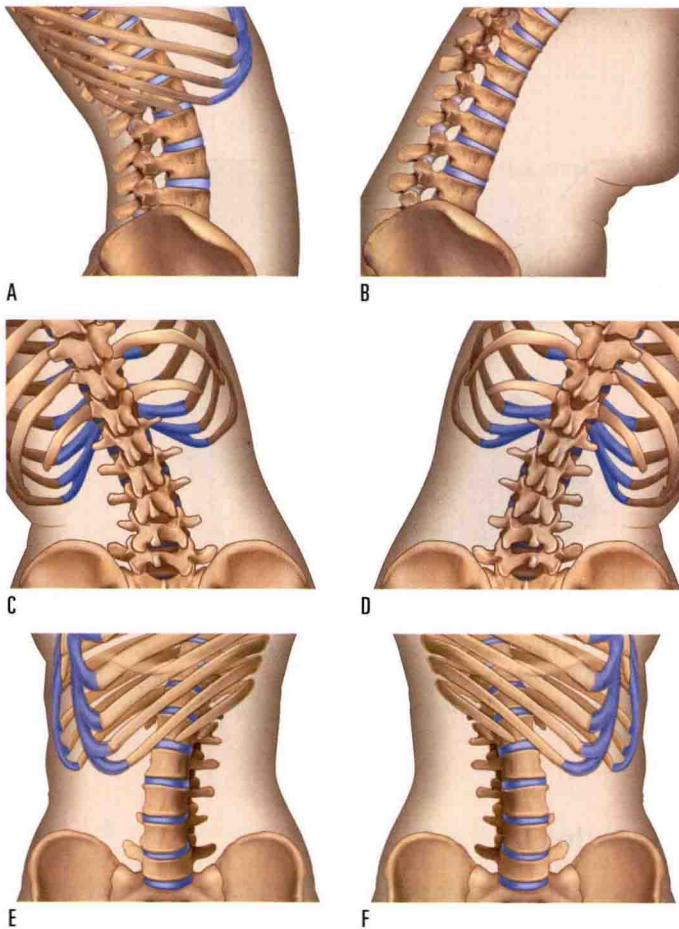
### Lumbar Spine Motions

The lumbar spine can move axially and nonaxially in all three cardinal planes (sagittal, frontal, and transverse). The axial motions, shown in Figure 1-9, are as follows:

- Extension and flexion in the sagittal plane
- Left lateral flexion and right lateral flexion in the frontal plane
- Right rotation and left rotation in the transverse plane

The term **ipsilateral rotation** is used to describe the motion created by a muscle that rotates the trunk to the same side





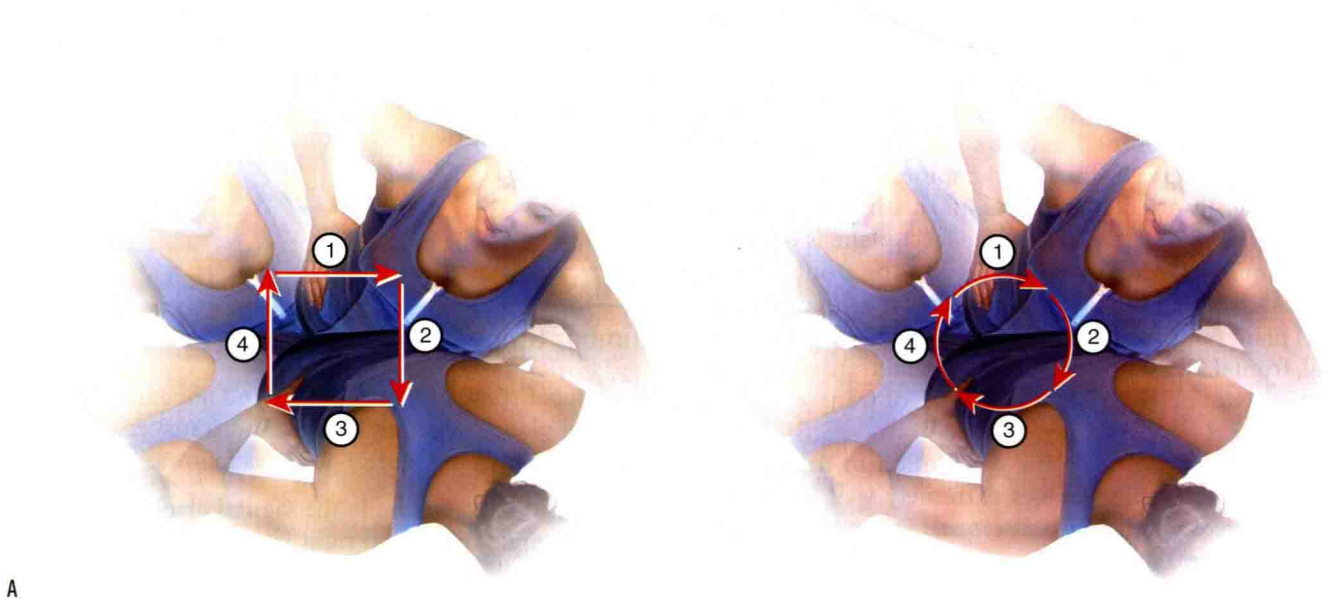
**Figure 1-9** Six axial cardinal plane motions of the lumbar spine. (A, B) Extension and flexion in the sagittal plane respectively; lateral views. (C, D) Left lateral flexion and right lateral flexion in the frontal plane respectively; posterior views. (E, F) Right rotation and left rotation in the transverse plane respectively; anterior views.

as where the muscle is located—in other words, a left-sided muscle that rotates the trunk to the left side is performing ipsilateral rotation, as is a right-sided muscle that rotates the trunk to the right side. The term **contralateral rotation** is used to describe the motion created by a muscle that rotates the trunk to the opposite side from where it is located—in other words, a left-sided muscle that rotates the trunk to the right side is performing contralateral rotation, as is a right-sided muscle that rotates the trunk to the left side.

The spinal joints of the trunk can also circumduct. **Circumduction** is not a joint action but a series of four joint actions performed in sequence: left lateral flexion, flexion, right lateral flexion, and extension. If these joint actions are carried out sequentially, one at a time, the trunk will transcribe a square shape. However, if these joint actions are performed smoothly, as is usually done, with the “corners” of the joint actions rounded off, then the trunk moves in a cone shape (Fig. 1-10) that leads many therapists to describe the motion as rotation. However, circumduction is not rotation—in fact, no transverse plane rotation occurs with circumduction. All four joint actions of circumduction occur in the sagittal and frontal planes.

Table 1-1 shows average healthy ranges of axial motion for the lumbar spine as well as the thoracic spine and the thoracolumbar spine. It is important to keep in mind that not every client will necessarily have these ranges. Ranges such as those shown in Table 1-1 are averages across the entire population. Elderly people usually have a smaller range of motion than do younger people, and people with chronic injuries may also have decreased ranges of motion.

The lumbar spine can also move nonaxially. Nonaxial joint motion is known as **translation**, or **glide**. The lumbar spine can translate/glide anteriorly and posteriorly, laterally to the right and left, and superiorly and inferiorly. Anterior translation is



**Figure 1-10** Circumduction of the trunk at the spinal joints. Circumduction is a series of four joint actions (left lateral flexion, flexion, right lateral flexion, and extension) carried out one after the other. (A) Joint actions shown sequentially. (B) Joint actions with the corners “rounded off.”