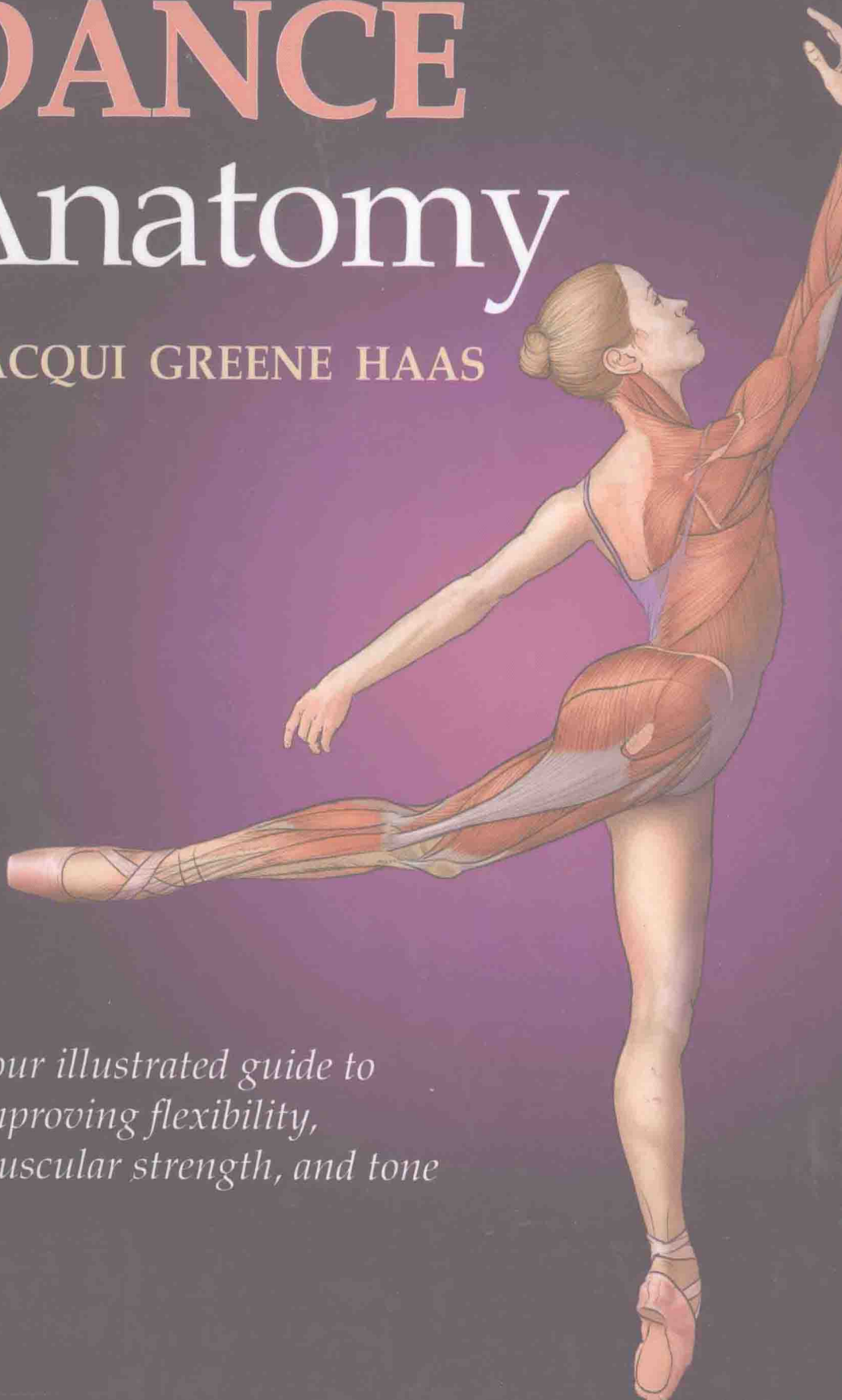
DANCE Anatomy

JACQUI GREENE HAAS



Your illustrated guide to improving flexibility, muscular strength, and tone

DANCE ANATOMY

Jacqui Greene Haas

Human Kinetics

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PREFACE

Dance is an extraordinary display of physical skill that can convey both raw energy and charming delight. Chiseled poses, innovative choreography, and striking images are the hallmarks of the art form. As a dancer today, you are truly fortunate. The opportunities to perform in competitions, Broadway shows, and professional ballet companies readily exist if you are strong and talented. Dance represents impeccable balance, intense muscular control, grace, rhythm, and speed. What could be more exciting than to be chosen by the artistic director to perform a leading role? But you must be mentally and physically fit in order to compete in this high-performance market. The need to impress audiences has never been more evident; extreme choreography sells tickets and wins competitions.

Dance schools, studios, and academies are busy places. Classes, rehearsals, performances, and competition schedules are overwhelming. You are working harder than ever and doing your best to understand every correction given. Your instructors are inundated with teaching technique, musicality, and tricky choreography as well as marketing their business. Sometimes the details of technique class can get overlooked. Dance technique has been passed down over the years with very little anatomical analysis. This tradition might have worked for generations, but in order for you to have an edge over other dancers today, you must understand basic anatomy and receive the most proficient training.

Each combination at the barre and in the center must have a definitive purpose. The barre work is not just a series of pliés and tendus but an organization of your body. Technique class should emphasize the development of muscular strength to control and protect the joints. You need to understand the actions of the muscle groups that create the various combinations of dance positions. For example, the muscles that create extension of a joint must contract throughout the whole range. If you are not sure which muscles create the extension, how can you possibly execute that combination effectively? You will continue to overrecruit the wrong muscles, either building bulk or causing an overuse injury.

Dance Anatomy will assist you in discovering more efficient ways of improving technique. You will enhance your movements by knowing exactly which muscles contract to create the action. This book has more than 100 illustrations of exercises that give you a visual understanding of anatomy. You will see inside every tendu, passé, and arabesque to help you improve your lines.

Each chapter addresses a key principle of movement to help you improve performance. Chapter 1 is the foundation of the book; it highlights three beautiful positions of dance showing the entire body and the musculature. This chapter also emphasizes the importance of having a basic understanding of how your body works through descriptions of anatomy, movement planes, and muscular actions.

Chapters 2 through 8 have been organized moving through the body from the center out. Chapter 2 addresses spinal alignment and placement—where it all begins. The spinal curves and all movements of the spine are addressed. Specific exercises are devoted to placement of the spine. The exercises in this chapter are not meant to be challenging; they are meant to educate you on muscular awareness and its role in supporting the spine for better alignment.

Chapter 3 focuses on the anatomy of breathing. It's common for dancers to breathe with the upper chest, creating tension and early fatigue. The illustrations show how the diaphragm, the lungs, and the ribs work together to provide more oxygen to your body and improve stamina. The five exercises in this chapter emphasize the details of breathing during various movements; they are meant to encourage quality of upper-body movement and reduce upper-body tension.

Chapter 4 details the role of the core musculature in dance movement and presents exercises that develop strength in the core. The quadratus lumborum and the iliopsoas also work together with the abdominal layers to provide stability for the spine. A basic dance class might not address all layers of abdominal muscles and their importance in enhancing technique, so supplemental core conditioning work is almost always necessary for dancers.

Chapter 5 details the musculature of the shoulders and arms; the exercises will help you improve your port de bras and lifting skills. Chapter 6 focuses on strengthening the pelvis for optimal hip rotation. The exercises in chapter 7 focus on elegance and power of the legs.

The majority of dance injuries occur at the ankles and feet, so chapter 8 emphasizes conditioning for the lower legs. There are 26 bones and 34 joints in the foot, thus creating multiple movement possibilities. These small joints are responsible for weight transfer, push-off, and landings. Without sufficient strength in these joints, alignment and technique will be compromised. Chapter 8 has detailed exercises for strength, alignment, balance, and flexibility of the lower legs, ankles, and feet.

Chapter 9 presents exercises that involve multiple areas of the body. In addition to strengthening, these exercises promote your body's ability to work as a unit to accomplish your positions and movements.

To benefit from the exercises in this book, you must develop an effective conditioning program that takes into consideration your changing cycles of classes, practices, and times of layoff. This may be a whole new concept for you, but the goals here are to limit the volume of ineffective training and improve the quality of effective training. Planning a supplementary conditioning program to enhance your technique is discussed in chapter 1.

To progress as a dancer, you need to be organized and precise in the overall appearance of your movement. Your body must have definitive direction within the space that you are using. The various imaginary planes mentioned throughout *Dance Anatomy* can help you establish detail in your lines and make the execution of the choreography clear and concise. If your movement is clean, it will be more rhythmic and musical. Whether you are competing in front of a panel of judges, performing on stage, or taking a technique class,

the judges, audiences, and instructors want to see power, clean lines, and a musical precision.

This book will answer your questions about achieving better turnout, a higher développé, a more flexible cambré, and a better arabesque. All of the exercises provide instruction on proper breathing techniques, education on recruiting the core muscles for improved placement, and important safety tips. The lists of muscles in the exercises are accompanied by detailed illustrations that highlight the muscles in the dance positions. You can actually see the relationship between the exercise and the dance position; this applies to all forms and styles of dance.

The exercises in *Dance Anatomy* will help you put more practical thought into your dance work without compromising the beauty of the art form. You can use this text as a tool for understanding corrections and the mechanics of your own body movements. You will benefit and continue the process of refining your physique and improving technique for that moment when the director picks you for the leading role!

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For Bob and my beautiful daughters, who, through their love and patience, teach me love and patience; for my beloved parents and one of my sisters who will never see this book, I'm sorry it took me so long; and for my other sweet sister, whose creativity and gentleness completes our family.

The dance medicine field has scores of talented health care professionals devoted to research and continuing education just for dancers. Their wisdom teaches me what I know today and what I will learn tomorrow.

We have different gifts according to the grace given us. If doing what you love is a gift, then I am blessed with gifts. My sincere gratitude to the many dancers I enjoyed working with during this process:

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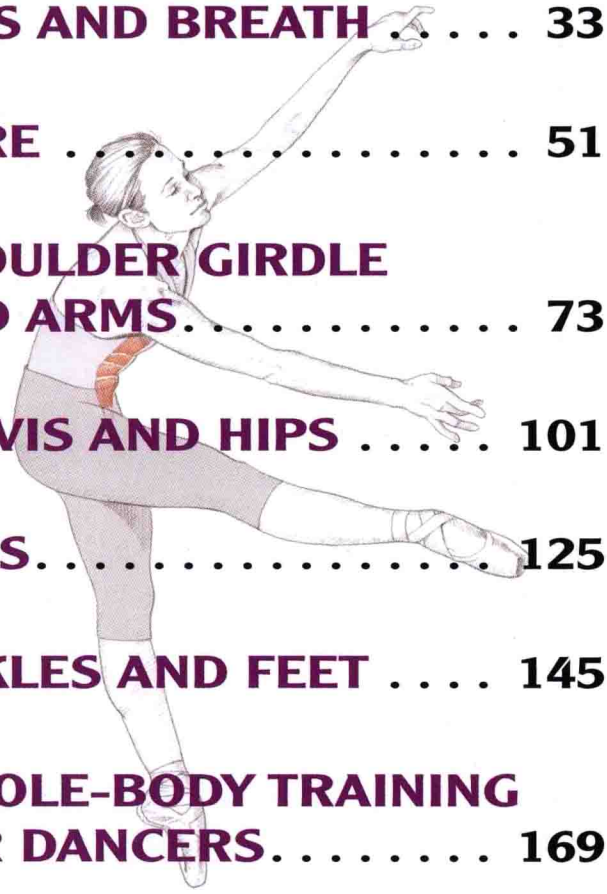

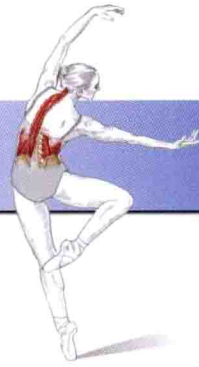

CHAPTER 1 THE DANCER IN MOTION

Motion is defined as any physical movement or change in position. But, when you watch a dancer in motion, it is much more than physical changes in position. It is a vibrant visual art of brief images created by strength, balance, and grace. The aesthetics of this art form can never be sacrificed by scientific analysis. But learning basic movement principles will allow your body to move effectively and safely. We use illustrations of three dance positions—the jazz layout position, the attitude derrière position, and the split jump—to demonstrate movement principles in this chapter. These are shown in figures 1.1, 1.2, and 1.3.

Figure 1.1 The jazz layout position.

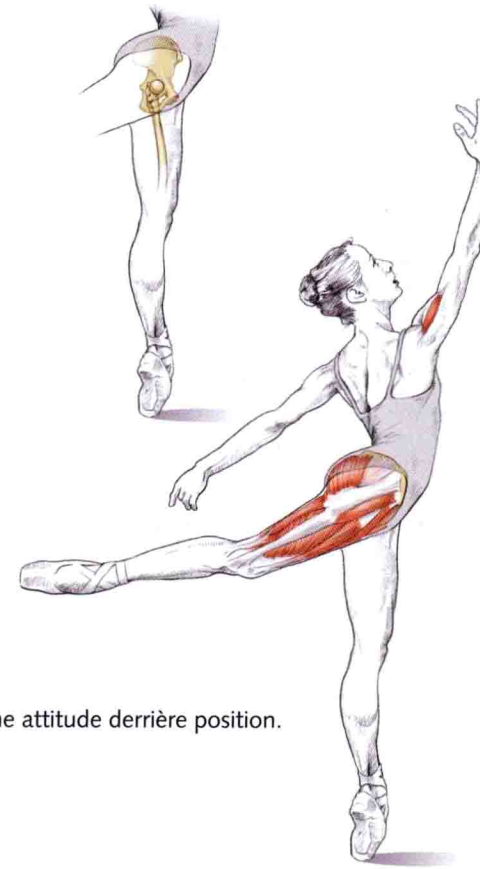

Figure 1.2 The attitude derrière position.

Figure 1.3
The split jump.

Bones, Joints, and Skeletal Muscles

To understand movement, you need to have a basic understanding of bones, joints, and muscles. They are the building blocks that provide you with the ability to create human motion. Your body is an amazing evolving gift of energy and information. Knowing how to organize the building blocks will give you fresh energy and enhance your skills as a dancer.

Bones

You have 206 bones in your body; they provide support and serve as levers for your muscles. Some bones provide protection for your internal organs, and some bones are responsible for producing red blood cells. You have long bones, short bones, and flat bones throughout your body that play a role in movement.

Movement operation involves the use of leverage. A lever is a rigid bar that moves a fixed point when effort, or force, is applied to it. The effort is used to move a resistance, or load. So, in your body, your joints are the fixed point, the bones are the levers, and the effort is the muscle contraction. For example, look at figure 1.1 of the jazz layout position. Focus on the gesture leg: The hip joint is the fixed point, the hip flexors are the effort by their contraction, and the femur (thigh bone) is the lever. Your muscles are attached to the bones by tendons, and the bones attach to each other by way of strong ligaments.

Joints

Joints are where two bones meet. You need to be familiar with several types of joints, but ball-and-socket, hinge, and gliding joints are the main types discussed in this text. All movement occurring at the joints have specific names, most working in pairs. The pairings typically describe movement in the same plane but work in opposite directions. For example, flexion at the knee would

represent bending of the knee; extension at the knee would represent straightening of the knee (table 1.1).

The hip and shoulder joints are described as ball-and-socket joints. One end of the bone is rounded, and the end of its meeting bone is cup shaped. In the hip, for example, this is important information for improving turnout and développé; we explore this concept further in chapter 6. The hip joint has a deeper cup than the shallow shoulder joint. Look closely at figure 1.2—the standing (supporting) leg's hip joint shows how the femoral head fits into the acetabulum. Visualize how movement occurs at this joint; it has rotational action as well as flexion and extension.

Gliding joints are made up of bones in which both ends are relatively flat; they allow for very little movement. For example, the point where each rib meets the spinal vertebrae is a gliding joint, as in figure 1.3. Notice how there can be very little movement where the vertebrae and the ribs meet. This is significant for understanding the lack of good flexibility throughout the mid-spine (thoracic) region, which is covered more in chapter 2.

A hinge joint is a bone with a slight concave end meeting a bone with a convex end. The knee would be described as a hinge joint. When the knee flexes and extends, it allows movement primarily in one plane. As you will learn later in this text, the knee does have a slight rotational movement as well. But focus on figure 1.1—the supporting leg is showing flexion of the knee while the gesture leg is showing extension of the knee.

Table 1.1 Joint Movements

Action	Movement	Example
Flexion	Bending, folding of a joint	Hip flexion: front of hip bends with grande battement devant
Extension	Straightening of a joint	Elbow straightens when in a push-up position
Abduction	Moving away from center	Arms in à la seconde: moving from alongside the body to second position
Adduction	Moving toward center	Assemblé: legs coming together
External rotation	Rotating outward	Turnout: grande plié in second position
Internal rotation	Rotating inward	Shoulder joint internally rotates to place the hand on the hip
Plantar flexion	Pointing the foot	Relevé, en pointe
Dorsiflexion	Flexing the foot	Rocking back on heels, lifting forefoot

Skeletal Muscles

Skeletal muscles initiate skeletal movement; they are composed of connective tissue partitions containing muscle cells, fibers, and numerous nerves. When the nerves are stimulated by your brain, a chemical reaction occurs, causing the muscle to contract. Each muscle has an origination point on a bone and an insertion point on a bone. Basically, on contraction, the muscle fibers shorten and have a tendency to pull both ends into the middle.

How muscles react to stimuli depends on their characteristics. There are basically two types of fibers in each muscle: slow twitch, or type I, and fast twitch, or type II. Slow-twitch fibers contract slowly and have a high resistance to fatigue. They are used primarily for placement and posture as well as aerobic activities. The fast-twitch fibers contract quicker and have a low resistance to fatigue. They can produce more power than slow-twitch fibers. Petit allegro, or short anaerobic movements, use primarily fast-twitch fibers. Most ballet dancers have a higher percentage of slow-twitch fibers, while dancers who have a more muscular or bulky look will have a higher percentage of fast-twitch fibers. No matter what your dance intensity level is, the slow-twitch fibers will be recruited first, followed by fast-twitch fibers.

All of your muscles have the capability of contracting, or creating tension, in various ways. Dynamic contraction is described as any type of tension on a muscle where the length of the muscle changes. This would certainly create movement at the joint. The two types of dynamic contractions are concentric and eccentric. Concentric contraction is typically a shortening of a muscle to create the movement, and eccentric contractions involve lengthening of the muscle. During pointe tendu, as the leg moves away from your center and your foot points, the calf muscles shorten, creating a concentric contraction. As your foot returns to the starting position, the calf muscles begin to lengthen. During that return phase, the calf muscles work eccentrically. The significance of this comes into play especially when landing from jumps. The eccentric contraction of the muscles will help to decelerate your body against gravity on landing. While you work so hard to build strength and power to jump higher, you also need to work on control to reduce the risk of injury and to make your return phase smooth and coordinated.

Another type of contraction that creates tension on the muscle but does not change the length is an isometric (also called static) contraction. An isometric contraction means equal length—the muscle fires, creating tension, but there is no joint movement. So, as you execute a relevé in first position and hold, the hold phase is an isometric contraction of all of the muscles in the legs. They contract concentrically to elevate you and then hold isometrically.

As your muscles contract to produce movement, various muscles work together to achieve the goal. All dance movements are carefully controlled because the muscles work so well together. Skeletal muscles are divided into four distinct categories: agonists, antagonists, synergists, and stabilizers.

- **Agonists.** The muscles that contract to produce the movement are the movers, or agonists. The ones that are the most effective in making that move-

ment happen are the primary movers. For example, the action of pointing your foot is created by the gastrocnemius and soleus muscles as the primary movers, but other muscles, called the secondary movers, assist.

- **Antagonists.** The muscles that oppose the primary movers are called antagonists. They somewhat relax and lengthen while the prime movers are working, but other times they can contract with the prime movers and provide a cocontraction. Now, as you might imagine, the agonists and the antagonists are located opposite of each other. Look at figure 1.2, and focus on the gesture leg in attitude derrière. The agonists are the hamstring and gluteal muscles that activate to move the leg to the back into hip extension. The antagonists are the hip flexors, or the muscles along the front of the hip and thigh. They are on a stretch while the movers contract. Now, imagine a grande plié in second position. As you are coming up, the quadriceps (agonists) are working to straighten the knee, but the hamstrings (antagonists) can contract as well, providing a cocontraction and better support for your knee joint.

- **Synergists.** Synergist muscles can be confusing, so let's break things down. Muscles that are considered synergists have two functions: They can promote the movement or they can neutralize the movement. What is so important for you to know is that the synergist muscles fire to help you define your movement. They can counteract any unwanted directional force. So, in figure 1.2, focus on the right arm. When you forcefully lift your arm by flexing at the shoulder joint, what helps to keep the humerus (upper arm) bone from separating away from the scapula (shoulder blade)? A small muscle hidden under the pectoralis major called the coracobrachialis displays synergistic qualities by contracting to assist in controlling the movement of the humerus in relation to the scapula. Although the primary movers get all the credit, the synergists help the agonists with establishing smooth and coordinated movement.

- **Stabilizers.** Muscles that are able to fixate a joint are called stabilizers. This is important and will be reviewed repeatedly throughout this book and its exercises. Stabilizers serve as anchors; they are able to hold a joint firm in order for other movement to occur. In figure 1.2, what is holding the spine stable? The abdominals are contracting to stabilize the spine; without that contraction, the momentum and strength of the gesture leg moving backward would cause the spine to collapse. You are working so hard on the leg that is creating most of the movement that you forget about the importance of the muscles that create stability and hold you firm in order for that movement to occur.

Movement Planes

Motion means changes in position; motion is created by force. For you, the coordinated efforts of body and mind create the force. So, let's begin by focusing on the efforts of your body and become familiar with some anatomical positions that are used in the text. When a muscle contracts, it produces movement at the joint, and the joint is the connector between the bones—easy enough, right? Dance moves you in all different directions, patterns, and shapes.

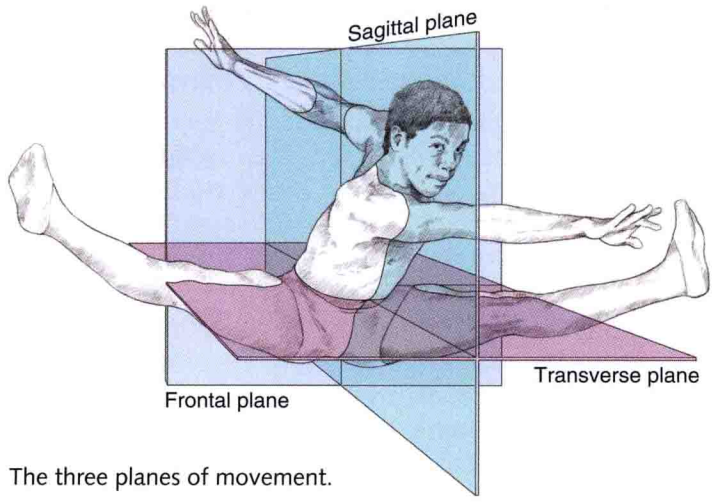

Figure 1.4 The three planes of movement.

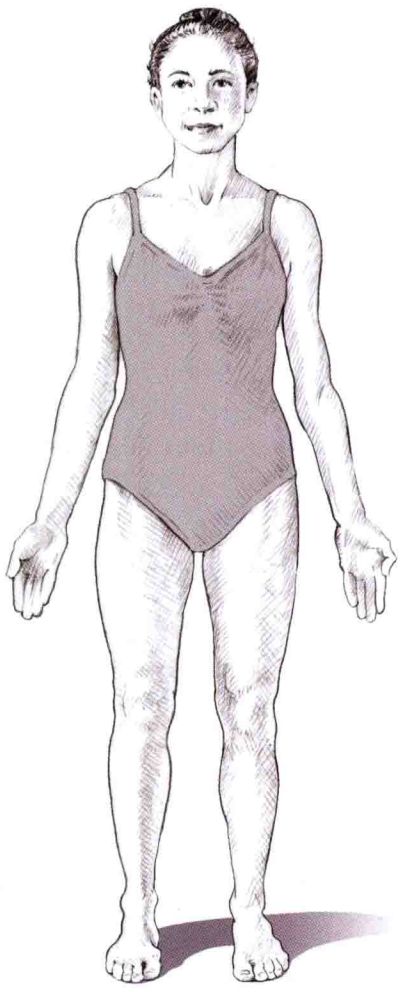

Figure 1.5 Standard anatomical position.

You can better understand these movements by dividing the body into three imaginary planes: frontal (vertical), sagittal, and transverse (horizontal), which will be described soon. Learning challenging choreography and executing the movement with beautiful lines come from a better understanding of how your body moves in space. Look at figure 1.4 showing these three planes within your body. These planes correspond to three dimensions in space.

Now, because you can change your orientation within space and your arms and legs can change position, it's important to organize positional directions of movement and refer to your body in a standard anatomical position, as in figure 1.5. That position is facing front, feet comfortably parallel, arms by your sides, and the palms of your hands rotated to face front. From this position, all directional body movements can begin from a starting point and all anatomical terminology has a starting point (table 1.2).

Table 1.2 Anatomical Position and Directional Terminology

Term	Definition
	POSITIONAL TERMINOLOGY
Anatomical position	Standing with feet and palms facing front
Supine	Lying on the back
Prone	Lying facedown
	DIRECTIONAL TERMINOLOGY
Superior	Above or toward head
Inferior	Below or toward feet
Anterior	Front side or in front of
Posterior	Back side or in back of
Medial	Closer to the median plane or toward midline
Lateral	Farther from the median plane or toward side
Proximal	Closer to root of limb, trunk, or center of body
Distal	Farther from root of limb, trunk, or center of body
Superficial	Closer to or on surface of body
Deep	Farther from surface of body
Palmar	Anterior aspect of hand in anatomical position
Dorsal (for hands or feet)	Posterior aspect of hand in anatomical position; top aspect of foot when standing in anatomical position
Plantar	Bottom aspect of foot when standing in anatomical position

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Now, continue to visualize your standard anatomical position with various imaginary planes within yourself. You are divided into upper and lower halves by a transverse plane, equal right and left portions by a sagittal plane, and front and back portions by a frontal plane. So, for example, when moving your arms from en bas through first to high fifth position, you are moving within your sagittal plane. That movement has a purpose—it's working within an imaginary plane to high fifth efficiently, with no deviation and with no incorporation of other movement. When you cambré to the side, you are moving in the frontal plane, moving directly to the side without any other inefficient movement, as if you are side bending along an imaginary pane of glass. In various hip-hop movements, the hips rotate in and out—that movement describes each hip moving along the transverse plane. The same would apply when twisting from the waist: Your trunk moves along the transverse plane. Look at figure 1.3, the split jump.

In which plane are the legs moving? The frontal plane. If one leg were slightly more forward, the movement would not produce the clean line that you strive for. You would need to continue to repeat that split jump until you got it correct. The repetition and overrehearsing due to lack of understanding of where the legs should be could lead to an overuse injury.

Mindful Connections

Your mind plays an intense role in dance anatomy and improvement in technique. Imagining moving faster or lifting your legs higher is part of being a dancer in motion as well as understanding primary muscle movement. Visualization can also be a tool for helping you dance more effectively. How many times do you practice the act of développé? How many times do you feel gripping in the thigh and anxiety because you are unable to raise the leg higher? Imagine what it would be like to know which muscles need to contract, lengthen, and stabilize without gripping. Imagine your leg elevating higher without anxiety. This is using your mind along with physical ability.

Visualization

Visualization, imagery, and *mental simulation* are terms used to describe creating a picture in your mind without doing the physical activity. There are many kinds of imagery, but for this text let's focus on basic visualization skills to improve performance. You can use simple positive images and focus on maintaining a calm center to release unwanted tension. Visualize exactly what you want your body to do and keep your thoughts positive. Eric Franklin is a master at visualization; I love his term *seed imagery*—planting an intuitive thought and letting that image grow to increase performance. When you repeatedly train your actions (as you do in class and rehearsal), you induce physiological changes and increase accuracy. Take a little time every day to find a quiet spot, close your eyes, and just listen to yourself breathe. Now, imagine the dancer you want to be, and see yourself moving with ease. Focus on how clean your lines are. Continue to visualize how much control you have with every combination you perform. You can see it in your mind, you can hear the music playing, and you can feel your body executing the sequences with detail. Now, all you have to do is *do* it! Let everything else go, and focus on your technique. You are training the relationship between your mind and your muscles. They must work together to help you reach your goals.

Tension Relief

Your state of mind will definitely influence the outcome of your work. If you prepare for a pirouette with tension in the upper body, stress about having to execute two, and anxiety about losing your balance, how on earth can you turn? Visualize beautiful multiple turns around a firm but calm center and breathe! Dance your way into the pirouette, enjoy turning, release the fear, use rhythm to help you, and *turn*!

Research continues to look at the proven connection between stress and injury. You seek perfection and you push yourself beyond your limits. Dance,

like any other sport, requires intense levels of training and conditioning to maintain the highest level of physical performance. When you allow competition anxiety or fear of failure to overwhelm your mind, you lose the ability to cope, and you put yourself at risk of getting hurt. When you can't maintain motivation, you create disruptions in attention, lose momentary awareness, and put yourself at risk for an acute injury. All of these stressors can also lead to hesitation, weakness in balance skills, and unwanted muscle tension.

The best dancers keep a healthy, positive conversation going within themselves to create motivation and encouragement. This inner dialogue can reduce tension and create an ease in your movement. Remember, you are building a healthy connection between mind and body. Accept yourself and love dancing—it's that easy! Be firm and tell yourself that it's possible. Unfortunately, you might be full of criticism and doubt; if you love to dance and want to improve, you must stop the negativity and dissatisfaction with yourself. Stay away from telling yourself you cannot do something or that some movement is too hard.

Dance-Focused Exercise

There is a distinct relationship between each exercise and the illustrations in these chapters. Throughout the exercises, visualize ease and balance in your neck as well as stability throughout your center, and allow those skills to carry over in your technique. For example, when performing the exercises for your legs, visualize ample joint mobility, not tension, in your hips. Remember to keep the images positive and brief. After practicing visualization skills during the exercises, send those brief images through your mind before classes, rehearsals, and performances. Notice how your skills improve; notice how you work more effectively with less gripping in your muscles. Keep using positive visualization skills. They are exercises of the mind and they require practice. Don't let negative thoughts creep back in and ruin your technique. Each chapter has a section called Dance-Focused Exercise guiding you on applying these skills to the exercises in that chapter.

Cardiorespiratory Benefits

Although dance-specific exercises are the focus of this book, the benefits of cardiorespiratory fitness cannot be overlooked. More and more medical research on dance documents that dancers' cardiorespiratory capacities are similar to the capacities of other athletes in nonendurance sports. Rehearsals and performances last for only brief periods; this type of exercise is referred to as anaerobic training. Aerobic training is required for improving cardiorespiratory health because it improves blood circulation and the supply of oxygen to the cells. Aerobic training increases heart size, which allows a larger volume of blood to be pumped through the body. Cardiorespiratory fitness allows for better transportation of oxygen and an increase in endurance levels. High cardiorespiratory endurance reduces physical and mental fatigue, which can also lead to injury. You can improve your cardiorespiratory endurance by training on an elliptical machine, treadmill, or stationary bike or swimming three or four times a week.