

## Bones, Joints + Skeletal Muscles

To understand movement, you need to have a basic understanding of bones, joints, and muscles.

### 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, some are responsible for producing red blood cells.

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. In your body, joints are the fixed point, bones are the levers, and the effort is the muscle contraction.

### Joints

Joints are where two bones meet. There are several types of joints, but we are most concerned with ball-and-socket, hinge and gliding joints.

### 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 a la seconde: moving from alongside the body to second position
Adduction	Moving toward center	Assemble: legs coming together
External rotation	Rotating outwards	Turnout: Grand plie in second position
Internal rotation	Rotating inwards	Shoulder joint internally rotates to place the hand on the hip
Plantar flexion	Pointing the foot	Releve, en pointe
Dorsiflexion	Flexing the foot	Rocking back on heels, lifting forefoot

### Skeletal Muscles

**Agonists**

The muscles that contract to produce the movement are the movers, or agonists. The ones that are the most effective in making that movement happen are the primary movers. For example, the action of pointing your foot is created by the gastrocnemius and soles muscles as the primary movers, but other muscles called the secondary muscles, assist.

**Antagonists**

The muscles that oppose the primary movers are called the 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 co-contraction. The agonists and antagonists are located opposite of each other. For example, in an attitude derriere, the agonists are the hamstring and gluteal muscles. They 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 they. They stretch as the hamstrings and gluteals contract.

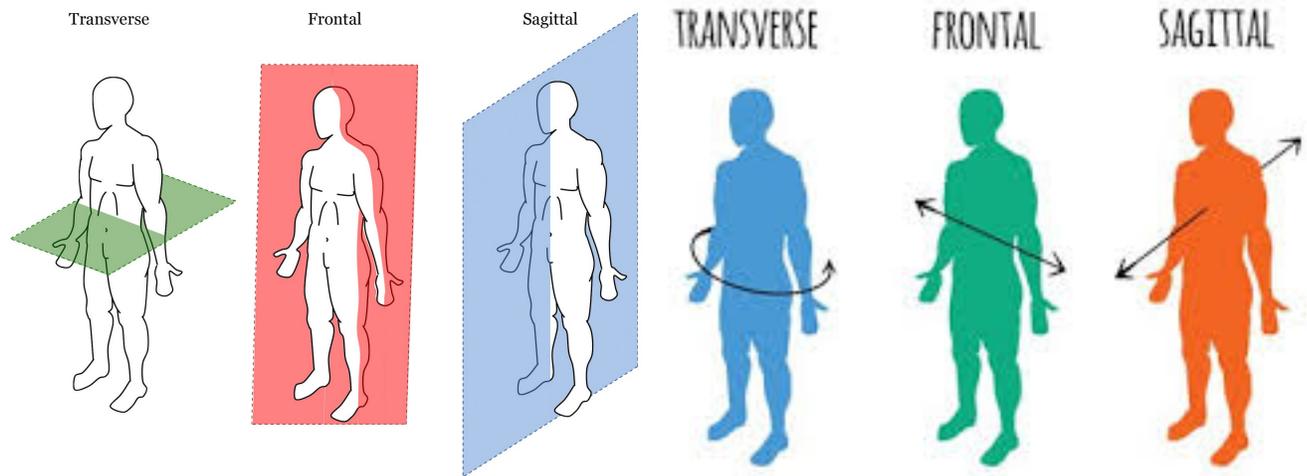
**Synergists**

Muscles that are considered synergists have two functions: they can promote the movement or they can neutralize the movement. When the arm is lifted by flexing at the shoulder joint, there is a muscle that keeps the shoulder blade down. This muscle assists in controlling the movement of the arm in relation to the shoulder. Synergists help the agonists with establishing smooth and coordinated movement.

**Stabilizers**

Muscles that are able to fixate a joint are called stabilizers. Stabilizers serve as anchors; they are able to hold joint firm in order for other movement to occur. The muscles in the core are strong stabilizers.

## Movement Planes



Examples of movement planes

### Transverse

Twisting or rotational movements occur in the transverse plane, such as twisting your head from side to side, or rotating hips in and out.

### Frontal

Frontal plane motion would include leaning from left to right as in side bends, and battement a la seconde, or jumping jacks.

### Sagittal

Front to back movements occur in the sagittal plane, such as walking, pushing, battement devant/derriere.

Term	Definition
<b>Positional Terminology</b>	
Anatomical Position	Standing with feet and palms facing front
Supine	Lying on the back
Prone	Lying facedown
<b>Directional Terminology</b>	
Superior	Above or toward head
Inferior	Below or toward feet
Anterior	Front or in front of
Posterior	Back 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 centre of body
Distal	Farther from root of limb, trunk, or centre 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

**Mindful Connections**

Your mind plays an intense role in dance anatomy and improvement in technique. How many times do you feel yourself gripping in the thigh and anxiety because you are unable to raise your leg higher in a developpe? 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.

You can use positive images and focus on maintaining a calm centre to release unwanted tension. Visualize exactly what you want your body to do and keep your thoughts positive. When you repeatedly train your actions, 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. Then 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. You are training the relationship between your mind and your muscles. They must work together to 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, stress about completing the turn, and feel anxiety over losing your balance, how on earth can you turn? Release the fear.

Research continues to look at the proven connection between stress and injury. Dance requires intense levels of training and conditioning to maintain the highest level of physical performance. When you allow 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 of even more injury. All of these stressors can also lead to hesitation, weakness in balance, 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.

## **Conditioning Principles**

### **Principle of Overload**

If you want to increase strength, you must continue to work the targeted muscle group past your normal load. The exercises are executed at maximal contraction throughout the entire range of motion. Typically, this type of training uses fewer repetitions and more resistance, and it works your muscles to fatigue.

### **Principle of Reversibility**

This refers to the fast loss of strength when the conditioning stops. In order to maintain your fitness level, continue with dance-specific conditioning at least four times a week if you are not dancing because of a holiday or break.

### **Principle of Specificity**

This relates to conditioning the dance-specific muscles that you need for improving your technique. In order for conditioning to be effective for dance, you must target and engage the muscles needed for dance.

### **Alignment**

All repetitions must be repeated without sacrificing alignment, core control, and proper breathing. Your goal is to work effectively. If you feel your alignment beginning to falter, stop, reorganize, and then start again. As you perform each exercise, emphasize the main muscles movement but notice how it affects your entire body.

### **Warm up and cool down**

Each conditioning session should begin with a basic warm-up to increase blood flow, accelerate breathing, and slightly raise body temperature. A sufficient cool down after conditioning allows the body to return to its resting state.

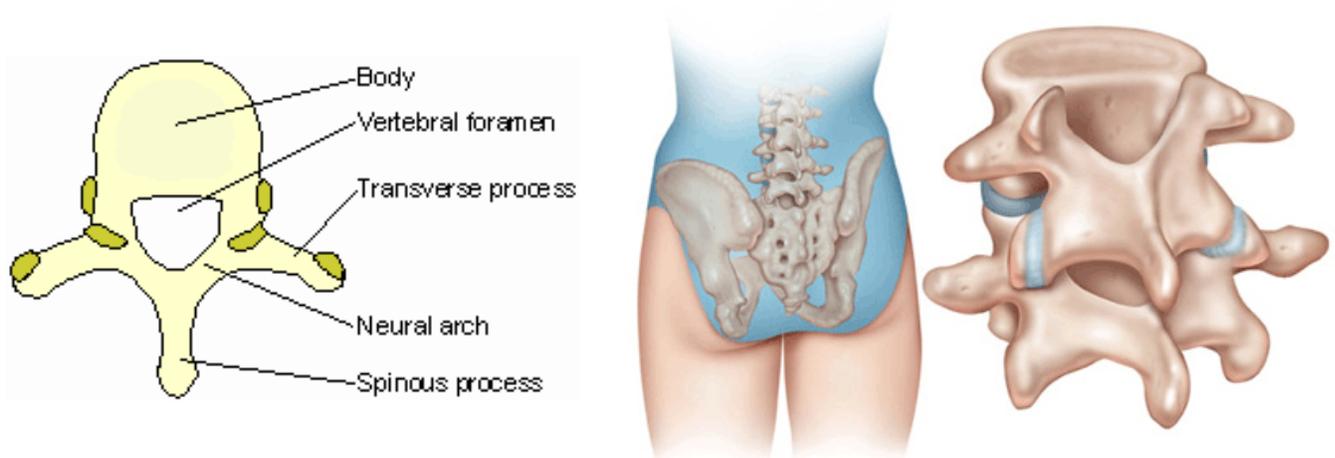
## The Spine

The spine is a column of 33 strong bones called vertebrae that connect the skull, shoulders, ribs, hips and legs; it is the centre of your skeleton.

The vertebrae also surround and protect the spinal cord, which transmits the impulses that control all voluntary and involuntary movements. The vertebrae are connected by small, fluid-filled sacs of tough, fibrous cartilage called discs, which allow for vertebral support as well as small amount of cushioning. The discs help to absorb shock, especially when you perform jumping and lifting movements.

The vertebrae cannot stand upright alone; they are supported by an elaborate system of ligaments. These ligaments are continuous bands that run down the front and back of the spine.

Basically, all vertebrae have common structural patterns: a body, the vertebral foramen, a spinous process, and two transverse processes. The body area of the vertebrae bears the weight of the body above it, the foramen creates the space for the spinal cord, and processes are sites for various muscle and ligament attachments.



## Muscular Balance

The primary muscles along the front of the spine are the rectus abdominis, and the internal and external obliques. The deepest of the abdominals is the transversus abdominis which is primarily a postural muscle and very important for spinal stability. The iliopsoas muscle has a direct connection with your lower spine, pelvis and femur bone. Weakness or tightness of the iliopsoas can create instability in the lower region of the spine.

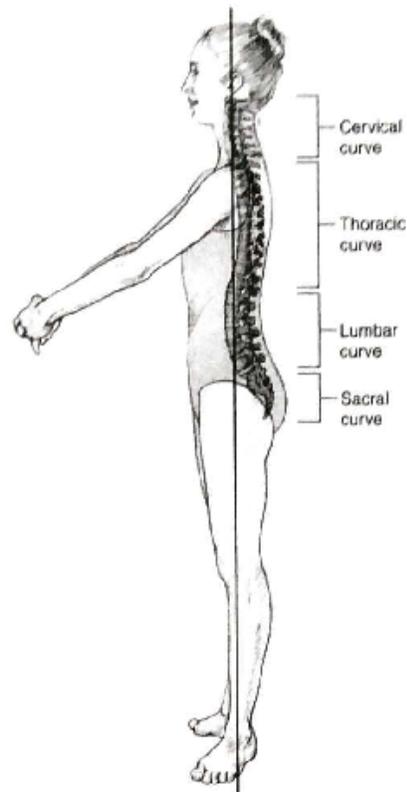
The posterior aspect of the spine is supported by the sacrospinalis (also known as erector spinae) and the deeper multifid muscles, which run from the pelvis to the base of the skull. These muscles are extremely important for improving body placement.

The pelvic floor of the body provides a strong base of support for the lower spine and pelvis.

Along the sides of the trunk are the quadratus lumborum muscles. These help you side bend and extend your lower back, but when they are tight, it can elevate the pelvis or cause hip hike, especially in grand battement.

A healthy balance of strength and flexibility along all sides of the spine provides the needed support for attaining well-aligned body placement.

## Neutral Spine



## Locating Neutral

1. Begin by standing with legs and arms in first position. Create a lifted quality through your spine; gently engage the low abdomen and visualize the plumb line.
2. As you inhale, lift the ribs, release your abdominals, and gently rock the front of your pelvis forward, arching the lower back and moving into an anterior tilt. Notice the tightness in the upper and lower back and the looseness in your abdominals.
3. As you begin to exhale, reverse the tilt and tighten through the abdominals; try to flatten the lower back and engage the gluteus maximus. Notice how the front of the hips tighten and how the front of the chest drops.
4. Now return to a neutral position visualizing the plumb line and gently lifting through your waist. There is balance between the abdominals and the spinal muscles and a renewed lengthened feeling in the spine.
5. Now, as you inhale, move into your anterior pelvic tilt. As you exhale, move into your natural position. Emphasize abdominal contraction and the external obliques to move into natural. Repeat this 10 to 12 times.

## Engaging Spine, Pelvis + Core

### STANDING DEEP BREATHS

Deep breaths connecting the diaphragm to the back of the spine.

Concentrate on the inhale/exhale, rise and fall.

Activate the **deep abdominal muscles** moving on the exhale.

### ROLL UP'S & ROLL DOWN'S

1/2 Roll down & Roll up of cervical spine - Standing

> Dancers will activate the cervical spine and connect abdomen and breath. Cervical spine activates while rolling down 1/2 way for 4 counts and up (4 counts of 8).

Activates head-shoulders-upper spine.

Full (floor) Roll-Up - Laying on back

> Arms up over head. Roll up through the spine, engaging in the contraction and initiating from the abdomen and core. Shoulders down. Come up to sitting. Contract pelvis and roll back down to floor to repeat

Up for 4 counts, down for 4 (2 counts of 8)

### HEEL ROCKS

Laying on back with legs extended. Heels are grounded. Ankles engaged in flexion. Reiterate difference of point and flex and where the initiation is supposed to come from. Vary tempo.

Dancers should feel sacrum-heel connection. (4 counts of 8)