

Beginning Dance: Introduction to Anatomy and Kinesiology for Dancers

The purpose of this discussion is to present the various scientific tools of movement analysis that support and facilitate the work of the dancer and the choreographer. Conscious awareness of the science of motion can do much to facilitate excellence in performance and prevent injury.

Overview of the Skeletal System

Ligaments are the connective tissue that connects bone to bone. Ligaments are pliable, but they are also very tough and inextensible. One does not wish to stretch a ligament. Once a ligament has been lengthened, the joint it supports no longer has its original stability. Owing to extreme demands for outward rotation and a high arabesque, dancers sometimes attempt to stretch the restricting ligaments, despite the risks.

Tendons: connect muscle to bone. They can contract like a muscle. Anything with “-itis” at the end (e.g. tendonitis) refers to irritation/overuse, such as doing too much in too short a period of time.

Fascia is fibrous connective tissue, less elastic than tendons but more elastic than ligaments. Fascia is located in high-stress areas of the body and provides a sheath of connective tissue support and protection (e.g in the foot)

There is an inverse relationship between mobility and stability. As mobility increases, stability decreases, and vice versa. Neither by itself is sufficient for excellence in dance. The dancer must be exceedingly mobile and yet still have the stability of a boulder.

Hypermobility refers to looseness in the joints: the more you stretch the ligaments, the more muscular strength you need. We need strength to protect our joints.

The better your alignment, the less stress on your joints.

The better your alignment, the easier it is to balance. Most problems with alignment are evident when rising out of your plié; the tendency is to lock knees into hyperextension.

Start at the bottom of the body and work up; *the foundation is of primary importance.* Many misalignments of the knee, hip, spine, and even shoulders can be traced to a chain reaction of compensations that began with a faulty foundation.

Planes of Action: Human movement occurs on 3 planes: the *sagittal* plane, the *frontal* plane, and the *transverse* plane.

- Basic movements of flexion, extension, and hyperextension occur on the sagittal plane.
- Basic movements of abduction and adduction occur on the frontal plane.
- Rotary movements occur on the transverse plane
- Movements to the diagonal involve movements on both the frontal and sagittal plane (combinations)

The Foot: divided into 3 major sections: the *phalanges*, the *metatarsals*, and the *tarsals*.

The Tarsus “joint” includes all of the actions that occur at the articulations of the seven tarsal bones with each other.

Pronation is called “beveling” the foot, and supination is called “sickling” the foot. The effect of pronated feet on knee alignment in plié: causes a rotary torque on the knees, a twisting force that is dangerous to the knee joint.

The leg: the *tibia* (medial side) and *fibula* (lateral side). Thigh bone: *femur*. The knee joint: articulation of the femur and tibia. The *patella* (knee cap) is not part of the true knee joint, but rather an anterior bony protection for the tissue within the knee joint.

Popping in the knee: normal popping occurs because the first movements of the joint after a period of rest stimulate the synovial membrane, which secretes synovial fluid and lubricates the joints. There is normal popping of the joints on the first few movements until the joint is “greased”. Friction, erosion, and irritation of the posterior surface of the patella may cause a buildup of bony scar tissue which results in a consistent grating and crunching of the knee in movement: this condition is called chondromalacia. Exercises to help this condition can be utilized.

When the knee is flexed, great care should be taken to keep the tibia/fibula directly in alignment (on the same sagittal plane) with the femur. Hyperextension of the knee joint is a major misalignment.

The Pelvis: In ideal pelvic alignment, the pelvis is neutral without tucking or arching. Ideal alignment is critical for the achievement of efficiency in action both at the hip joint and at the lumbar spine.

The Spine: *coccyx* (a fusion of the bones), the *sacrum* (also a fusion of bones), 5 *lumbar vertebrae*, 12 *thoracic vertebrae*, and 7 *cervical vertebrae*. The spine serves as the support structure for the entire upper body.

The shoulder girdle is made up of the *clavicle* and the *scapula*. The *humerus* is the long bone of the upper arm, and the lower arm is made up of the *radius* (medial side) and *ulna* (lateral side). The hand is divided into three regions: the *carpal*, *metacarpal*, and *phalanges*.

Overview of the Muscular System

The muscular system provides the power for both movement through space and maintenance of a given position in space. All controlled movement is a tug-of-war with gravity. Muscles can only pull, they cannot push. Muscles contract in the center and pull equally on both ends. In a plie, you are allowing gravity to win the “tug of war”, whereas in releve, you are actively “defying” gravity.

There are two major sets of **muscles at the knee joint:** the *quadriceps* and the *hamstrings*.

Rotator muscles in the hip joint provide outward rotation (turnout). Hip flexor muscles can shorten (especially when sitting for prolonged periods of time), so stretching the hip flexors is important. (It can even help with low back pain, “bubble buns” and “thunder thighs”).

An adductor muscle brings bones closer to the midline.

The **abdominal muscles:** *rectus abdominus*, *transversalis*, *internal and external obliques*. Movement starts at the center. If the muscles of the torso are weak, a galaxy of compensations must be made – such as recruiting other muscles to aid in the task.

Commonly used **shoulder and upper arm muscles** include the *trapezius*, *biceps* and the *triceps*. When dancers are told to “keep their shoulders down”, the upper trapezius is the prime mover in this action of the scapula (elevation), so you need to engage your lower trapezius, pectoralis minor, and subclavius. In the arm, your biceps are anterior and triceps are posterior.