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## **What is functional anatomy and why is it important for dancers to understand it?**

Farah Fadzali, September 2021

Dancers often face unique health issues such as higher injury rates, functional, nutritional, and psychological concerns. Therefore, it is crucial to develop dancers with high health literacy. In this article, we will discuss functional dance anatomy and its importance.

Functional anatomy studies the structure of organ systems. It is important for dancers to understand their own anatomy as it can help a dancer stay in shape, improve performance, increase confidence and add longevity to his or her performing career. It can also help a dancer prevent injuries. If an injury does occur, knowledge of human anatomy can contribute to a safer process of healing and recovery.

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## Anatomical Terminology

When learning anatomy, it is necessary to learn some useful terminology for describing the body structure.

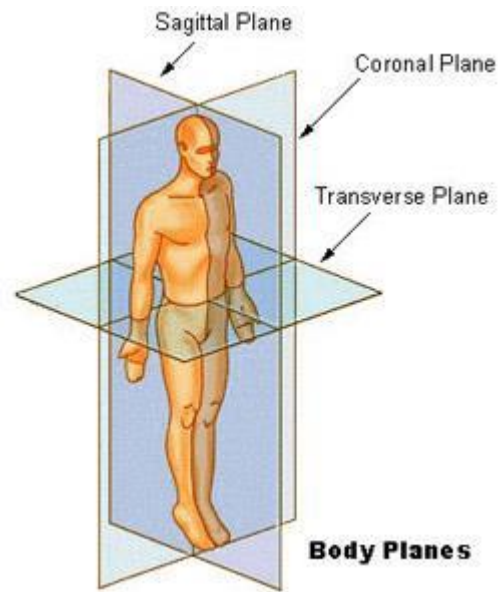
### Directional Terms

Directional terms describe the positions of structures relative to other structures or locations in the body.

Terminology	Description	Example
<b>Superior or Cranial</b>	Toward the head end of body; upper	E.g. The hand is part of the superior extremity
<b>Inferior or Caudal</b>	Away from the head; lower	E.g. The foot is part of the inferior extremity
<b>Anterior or Ventral</b>	Front	E.g. The kneecap is located on the anterior side of the leg
<b>Posterior or Dorsal</b>	Back	E.g. The shoulder blades are located on the posterior side of the body
<b>Medial</b>	Toward the midline of the body	E.g. The middle toe is located at the medial side of the foot
<b>Lateral</b>	Away from the midline of the body	E.g. The little toe is located at the lateral side of the foot
<b>Proximal</b>	Toward or nearest the trunk or the point of origin of a part	E.g. The proximal end of the femur joins with the pelvic bone
<b>Distal</b>	Away from the furthest from the trunk or the point or origin of a part	E.g. The hand is located at the distal end of the forearm

## Planes of the Body

- **Coronal Plane** (Frontal Plane): A vertical plane running from side to side; divides the body or any of its parts into anterior and posterior portions.
- **Sagittal Plane** (Lateral Plane) - A vertical plane running from front to back; divides the body or any of its parts into right and left sides.
- **Axial Plane** (Transverse Plane) - A horizontal plane; divides the body or any of its parts into upper and lower parts.
- **Median plane** - Sagittal plane through the midline of the body; divides the body or any of its parts into right and left halves.



## Organ System

The muscular and skeletal systems which we will be discussing next are 2 of the 10 major organ systems in the human body. The other 8 major organ systems are nervous, cardiovascular, endocrine, lymphatic, respiratory, digestive, urinary and the reproductive system. Organ systems are composed of two or more different organs which work together to provide a common function. In this case, the function here is movement.

## Skeletal System

The skeletal system is made up of bones, cartilage, tendons and ligaments. It accomplishes three major functions: providing support for the body, protecting delicate internal organs and providing attachment sites for the muscles or organs. To have a framework of understanding the body, it is helpful to be able to name and identify basic elements of the skeletal structure (see Fig. 1).

An example of skeletal system function is the atlas (the first cervical vertebra). The atlas is a pivot point to nod your head signifying yes in an up and down motion. If we were to look closely at this action, minimal impact is made

on the spine. If we habitually nod to look down at our computer or phone with the vertebra



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further down the spine, the large muscle structures of the back will have to do more work which can lead to muscle fatigue and pain.

On the hand, the bones are made up of different types of tissue:

- Compact tissue (harder, outer tissue of bones)
- Cancellous tissue (sponge-like tissue inside bones)
- Subchondral tissue (smooth tissue at the ends of bones which is covered with another type of tissue called cartilage)

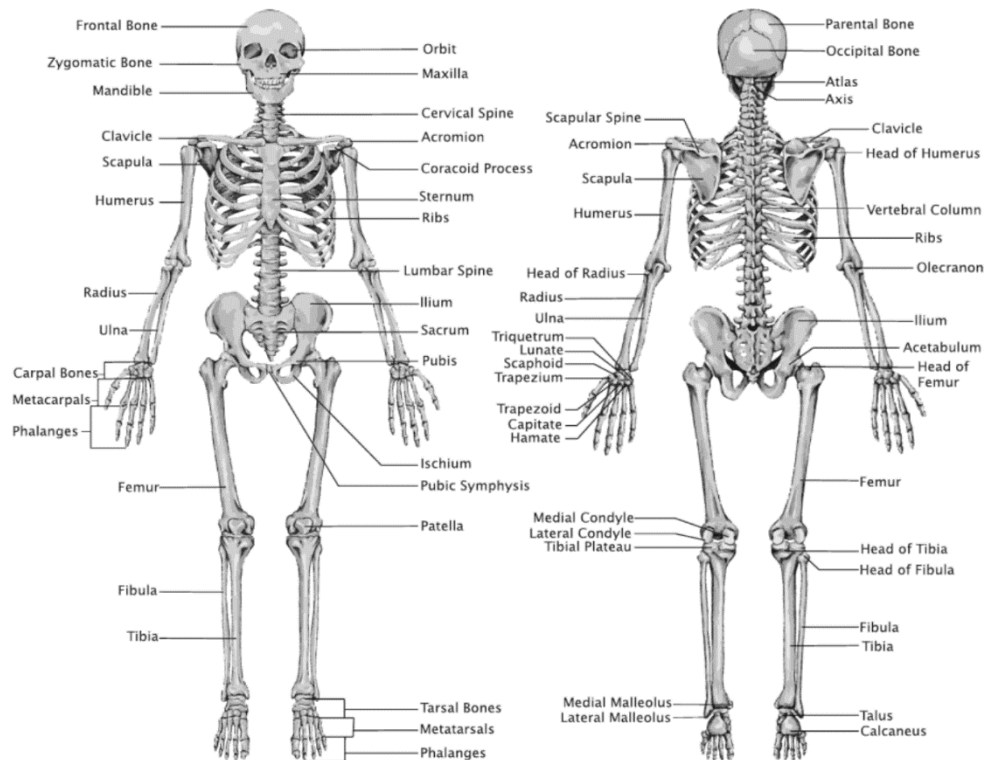


Fig. 1 The Skeletal System

*Dance movement example:* When performing plié in ballet, dancers have to note that this movement involves the pelvic girdle which is made up of two halves (innominate bones) and a sacrum (bottom part of the spine). The top rims of the pelvic halves are on a different diagonal from the bottom of the pelvis, or the sitz bones (ischial tuberosities). As dancers go into the plié position, the sitz bones move apart (widen). This allows the pelvic floor (between the sitz bones) to stretch and the hip joints to bend (flex/fold) properly. However, if dancers tend to grip onto the pelvis during plié, it will cause tightening in the hip joints and knees, which reduces turnout. The femurs (thigh bones) on the other hand rotate outwards. This is not abduction, or moving the legs sideways, but an external rotation that occurs naturally on the descent due to the design of the leg.

## Muscular System

The muscular system is made up of skeletal, cardiac and smooth muscles throughout the body. Its main role is to provide mobility (movement of the limbs or movement of materials through some organs like the stomach, intestine, heart and circulatory system). The most important attribute of muscles is that they are made up of contractile fibres\*. They change their size to produce movement and both their ability to contract and to expand is what creates their efficiency.

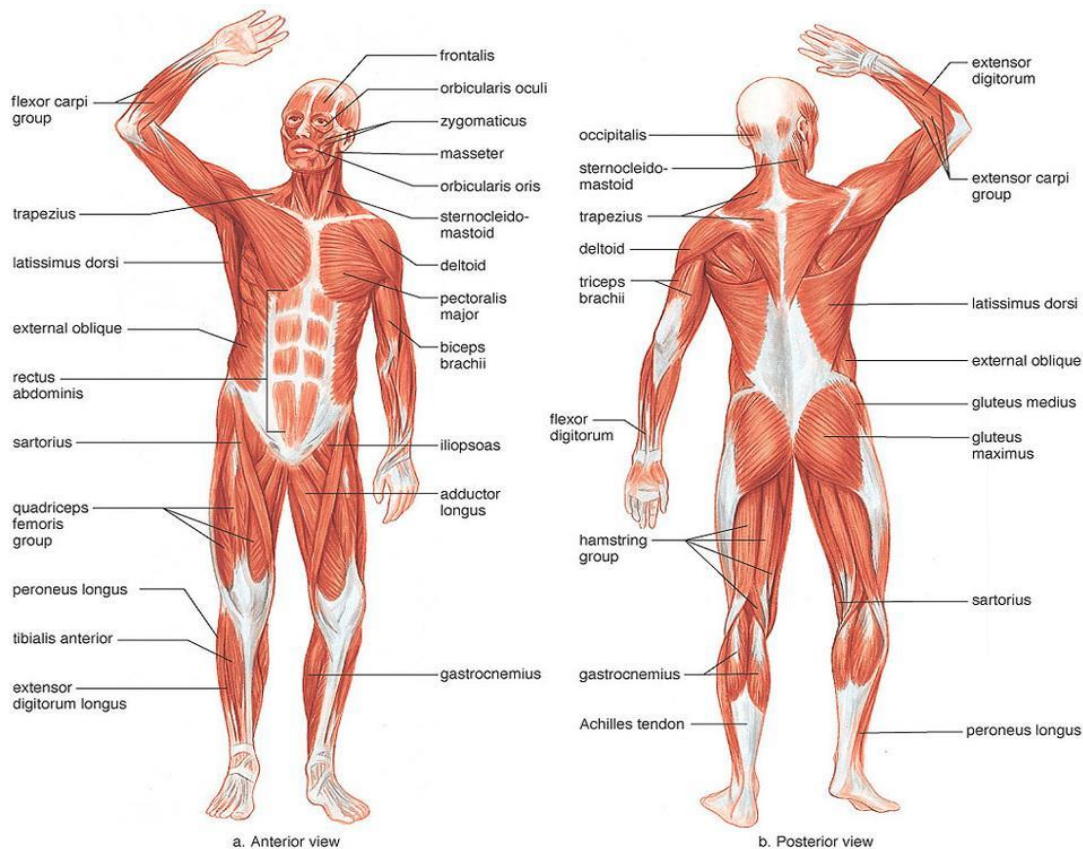


Fig. 2 The Muscular System

Definition:

\*Contractile fibres: Fibres, **composed of actin, myosin, and associated proteins**, found in cells of smooth or striated muscle.

*Dance movement example:* In the ballet grand plié position, the soleus, gastrocnemius, quadriceps, fibularis longus, fibularis brevis, flexor hallucis longus, flexor digitorum longus, tibialis posterior, peroneus brevis, gluteus maximus, adductor magnus, adductor longus muscles all lengthens while contracting. The muscles that hold the contracted position are namely the deep six lateral rotators, biceps femoris (assist in holding the hip and knee position), spinal extensors (to hold the spine vertically), rectus abdominis and psoas minor (prevents anterior pelvic tilt) and adductors and pectineus muscles.

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## Importance on applying functional anatomy in dance

Knowing your scapula from your patella isn't just for people in the medical field. Though complex anatomical terminology may feel like a barrier, dancers are ideal learners because they already spend so much time paying attention to what their bodies can and cannot do. This knowledge is relevant to a dancer's life which makes it very accessible. Even young children can pick up anatomical terms, giving them more interesting words to describe our body parts is fascinating to kids. As a dance practitioner, use anatomical terms like "lumbar spine" interchangeably with descriptive terms like "lower back." The more often young dancers hear those words in context, the more likely it is they will stick.



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Early exposure will help dancers of various age groups especially those that are training vocationally to understand how their body parts function in isolation enabling them to create beautiful and articulate movement integration. At the same time, introducing anatomical concepts in technique class has the potential to create dancers who have greater control over and respect for their instrument.

End



An MSc in Dance Science graduate from Trinity Laban Conservatoire of Music and Dance, Farah has multiple experience in teaching movement therapy in various organisations in Singapore.

Farah is now a dance science researcher studying injury prevention and performer's health and safety practices. Together with her achievements and qualifications, Farah hopes to work towards the development of dance science research in Singapore.

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