Anatomy Notes for Aerialists

These ideas translate into how we use the equipment. Good alignment gives good mechanical advantage in most movements and also protects the body against injury.

Bones form the skeletal structure that supports the weight of the body and protects organs. The average adult skeleton has 206 bones. Bones can be categorized as paired or unpaired. A paired bone is two bones of the same type located on the right and left sides of the body, whereas an unpaired bone is a bone located on the midline of the body.

Joints are where bones connect usually. There are mean types of joint

- Hinge like in your knee and elbow, enable movement similar to the opening and closing of a hinged door but not side-to-side or lateral movement. The elbows, the knees, and the middle and end joints of the fingers are hinge joints. Hinge joints are prone to injury when lateral forces are applied to the joint.
- Pivot joints are specially suited for rotating movements. The articulation between the atlas and axis bones in the neck is a pivot joint, which enables the head to turn from side to side. Pivot joints also join the two bones of the forearm
- Coloynoid or Ellipsoidal joints, such as the joints of the wrist and feet allow bending and extending, rocking from side to side, but rotation is limited.
- Ball and socket like your hip and shoulder joints, are the most mobile type of joint in the human body. The end of the upper arm and leg bone is rounded, appearing much like a half ball. This bony ball fits into a cup-like socket. The upper arms and legs are capable of moving backward, forward, and to the side. In addition, a ball-and-socket joint allows for rotation of the long bones within the joint (a swivel action), providing the arms and legs with a remarkable range of complex movement.
- The only saddle joints in your body are in your thumbs. The bones in a saddle joint can rock back and forth and from side to side, but they have limited rotation. The saddle joint allows the thumb to move toward the palm, enabling you to grasp objects between your thumb and fingers.

Ligaments are short band of tough, flexible fibrous connective tissue which connects two bones or cartilages or holds together a joint. The should not be stretched as once stretched they cannot return back to shape and therefore leave a weekend joint. Over stretching can lead to tears and breaks which can only be repaired surgically.

Muscles are attached to bones by **Tendons**. Muscles are elastic i.e they stretch but tendons do not. Overstretching or stretching when cold (i.e. muscles are least elastic) transfers force to the tendon causing them to pull away from bones. Muscles are made up of two main types of fibre fast twitch and slow twitch fibres. Fast twitch aid dynamic movement and power (strength with quickness). Slow twitch fibres support sustained movement and endurance (strength over time). When warming up we need to include movements that stimulate both types of muscles to be fully ready to work, however generally when we begin to train aerial we focus on static movement to build stability and progress to dynamic movements once the body has the strength to stabilise joints through dynamic moves.

Facia is a sheet of connective tissue, primarily collagen that attaches, stabilises, encloses, and separates muscles and other internal organs. Follow these links for a few interesting articles on Fascia.
http://www.runnersworld.com/injury-treatment/understanding-your-fascia
http://breakingmuscle.com/mobility-recovery/the-top-5-ways-fascia-matters-to-athletes

Nerves carry messages between muscle and brain and are embedded in Fascia. They merge in the spinal cord which is why it is such a fragile area of the body. When we think of training we must also think about training the nerves ability to carry information. This is why it is important to

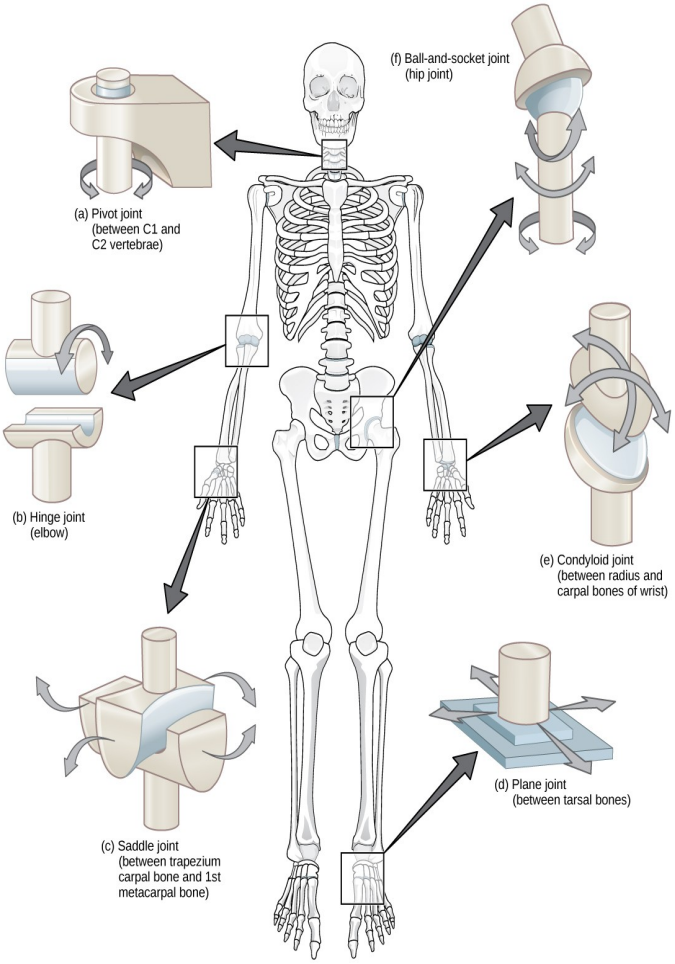
incorporate co-ordination exercises in warm ups, particularly ones that relate to movement patterns about to be used in aerial work both in range of movement and speed of action.

A large **Range of Motion** is advantageous for aerial work however some people have abnormally large ranges of motion (Laxity) in particular joints. This means the joints are able to slip easily out of alignment, extra work must be done on stabilisation of joints through conditioning of muscles in area. This is particularly true of shoulder joint. The shoulder is supported by four small muscles that are often ignore in aerial training in favour of training the larger muscles.

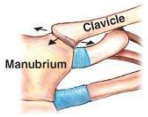
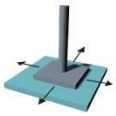
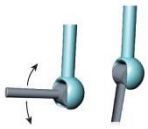
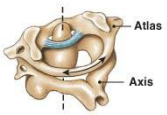
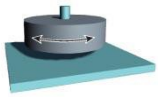
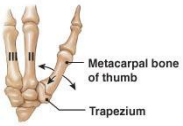
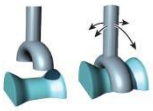
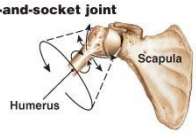
https://www.youtube.com/watch?v=A-MZOdHH3Nc
https://www.youtube.com/watch?v=stfxHs-pI_M

Great video about shoulder alignment: https://www.youtube.com/watch?v=xNI-mBOHtL4

Three types of Muscle Contraction
Concentric - Shortening under a load
Eccentric - Lengthening under a load
Isometric - A contraction with little or no movement (usually seen when stabilising for e.g a plank)



The anatomical types of synovial joints, with joint models and examples

Types of Synovial Joints	Models of Joint Motion	Examples
Gliding joint  		• Acromioclavicular and sternoclavicular joints • Intercarpal and intertarsal joints • Vertebrocostal joints • Sacro-iliac joints
Hinge joint  		• Elbow joints • Knee joints • Ankle joints • Interphalangeal joints
Pivot joint  		• Atlas/axis • Proximal radio-ulnar joints
Ellipsoid joint  		• Radiocarpal joints • Metacarpophalangeal joints 2–5 • Metatarsophalangeal joints
Saddle joint  		• First carpometacarpal joints
Ball-and-socket joint  		• Shoulder joints • Hip joints