



# ***FITNESS & NUTRITION EXPERT PROGRAM***

## ***FITNESS SESSION 3:***

Skeletal Anatomy & Flexibility





You're a ghost  
driving a meat  
coated skeleton  
made from  
stardust, what do  
you have to be  
scared of?

## What we are going to cover



### **INTRODUCTION TO THE FITT PRINCIPLE**

- What is the FITT principle and how to apply it

### **SKELETAL ANATOMY**

- Facts and components of the skeleton
- Primary functions and structure of the skeleton
- Learning the major bones in the skeleton
- Identification, Classification, and Markings of bones and joints
- How Exercise affects bones and joints
- Anatomical position and terminology
- Planes of movement and joint movement terminology

### **FLEXIBILITY**

- What is Flexibility
- Benefits of Flexibility Training
- Assessing Flexibility
- Designing a Flexibility Training Program



## What you need before we start

1. Water
2. Put your finger tips together
3. Take 3 deep breaths



## The FITT Principle

### Frequency

- How many days per week?

### Intensity

- How hard?

### Time

- How long?

### Type

- What kind of exercise?



When you are designing a program, these are the things you want think about.

Frequency: How often will I do this?

Intensity: How hard will it be?

Time: How long will I do it for? How long is each session, how long is overall program.

Type: What am I going to do?

## The FITT Principle - Example

### For a runner with a 5km goal

#### Frequency

- 3 days a week

#### Intensity

- Slow and steady

#### Time

- 5 mins to start

#### Type

- Running



This is a super simplistic example of applying fit.

Whenever we design a program for someone, we run through these variables.

If we want to progressively overload their program (make it harder), we think, “am I going to make them do it more frequently, more intensely, for longer, or make them do something else?”

## The FITT Principle - Example

For an experienced runner (she's been running 3-5 x a week for 1 year) who wants to get a Personal Best on a 5K this spring.



Fit to 100, 8.3.9.18 10:00 AM

## The FITT Principle – Example

**For an experienced runner with a 5k PB goal**

### **Frequency**

- 5 days a week

### **Intensity**

- Varied but mostly High!

### **Time**

- Approx. 30 - 40mins

### **Type**

- Running



In this example you have a runner that's already used to high volume so their body can handle an increase in intensity. The increase in intensity is what will push their body to a faster time. You don't necessarily want all their runs being at a high intensity but a few key runs should be. You should also have a run that's a little longer than their average 5km, maybe have them do a 6k so on race day a 5km seems that much more doable.

PB = personal best



## Facts about the Skeletal




- Human adult skeleton has 206 bones (we used to have 300!)
- We achieve maximum bone density at age 30
- Female skeleton has a larger pelvic capacity but is otherwise usually smaller
- Our bones are alive!
  - Bones are highly vascular
  - Bones undergo extensive remodeling throughout life
  - Bones respond to stress and grow thicker and stronger with physical activity and become thin and brittle with inactivity

At birth, you have about 270-300 bones. As you grow older, small bones join together to make big ones (think of your skull)

Adults end up with about 206 bones. But we don't end up with our final amount of bones until age 20-25

We achieve maximum bone density by age 30, after which our bones get more brittle. Exercise helps maintain the strength of our bones.

- Men's bones are usually larger and heavier than females
- Bones are alive, that is why they can grow and repair themselves when broken



## Components of the Skeleton

- Axial Skeleton (keeps you upright!)
  - Skull, thoracic cage, vertebral column, and various cartilages
  - Forms the longitudinal axis of the body
  - 80 bones
  - Supports and protects the brain, spinal cord, and organs in the ventral body cavity
  - Provides an extensive surface for the attachment of muscles
- Appendicular Skeleton (helps you move!)
  - Limbs and girdles (pectoral and pelvic)
  - 126 bones
- The skeletal system also includes:
  - Cartilage- Flexible supporting framework
  - Tendons - Connects bones to muscles
  - Ligaments - Connects bones to other bones

The axial skeleton makes up our central axis and consists of the following bones: skull, vertebrae, ribs and sternum.

The appendicular skeleton consists of the limbs and girdles. The girdles are the attachment points for the limbs. The pelvic girdle is the attachment point for our thigh bone (femur) and consists of an individual os coxae (ilium, ischium, pubis). The pectoral girdle is formed by the clavicle and scapula and serves as the attachment point for our arms (humerus).

There are three types of cartilage

1. Hyaline: - provides stiff but flexible support and reduces friction btw boney surfaces


- found between the ribs and the sternum, covers the surfaces at mobile joints, supports the respiratory passageways, forms part of the nasal septum

2. Elastic: - can be bent and twisted without damage and will return to its normal shape  
- supports the external ear and a number of internal structures

3. Fibrocartilage: - resists compression, prevents bone-to-bone contact, and limit relative movement

- the meniscus, between the bones at the pubic symphysis, in the

intervertebral discs



## Essential Functions of the Skeleton/Bone

1. Protection of organs (skull, ribs, etc!)
2. Structure and shape
  - Endomorphs - Apple or pear shape
  - Ectomorphs - Tall and thin
  - Mesomorphs - Short and muscular
3. Movement
  - Muscles pull on bones to create movement at joints
4. Red Blood cell Production
5. Mineral Storage
6. Endocrine Regulation (Bone Only)

### Protection

The axial skeleton, consisting of the skull, thorax and vertebral column, is the primary division of the skeleton responsible for protecting vital organs. The skull protects the brain and the vertebral column protects the spinal cord, both vital organs within the nervous system. The sternum and rib cage work together to protect the heart and lungs. The pelvis (part of the appendicular skeleton) cradles the digestive and reproductive organs.

### Support

The skeletal system provides structure and support for the entire body. The skeleton also provides a framework for all other soft tissues (muscle and organs) to attach to.

### Locomotion

Interaction between the muscular system and the skeletal system allows the bones in the body to move. Muscles are connected to bone by tendons,

### Production of Red Blood Cells

Bone marrow that is located in certain bone structures (flat bones and at the ends of long bones) produces red blood cells for the body.

Red blood cells survive on average 120 days

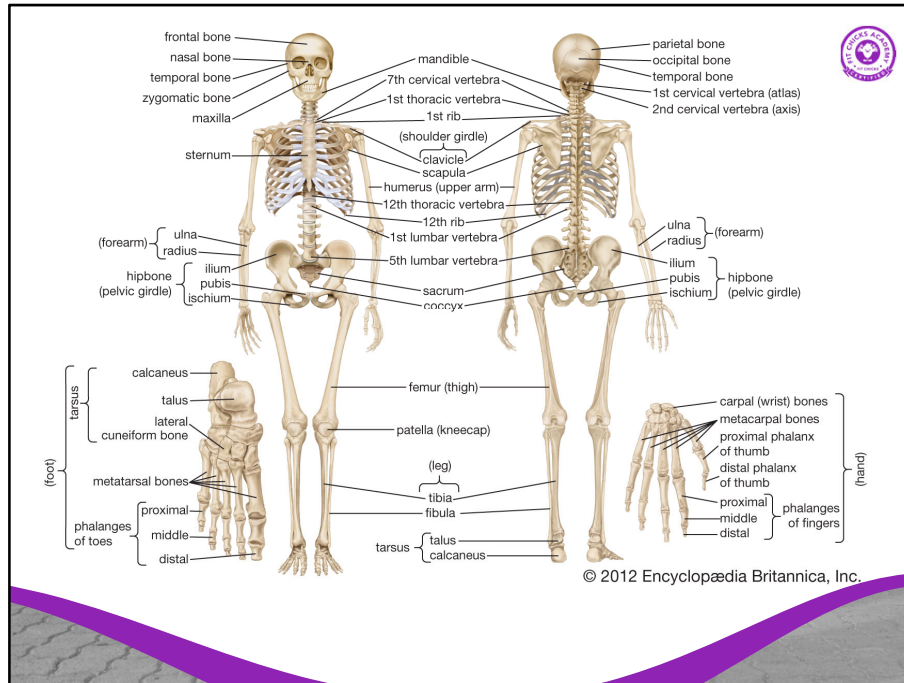
Healthy marrow produces, on average, 2.6 million red blood cells per second.

### Mineral Storage

Bones store important minerals such as calcium and phosphorus for the body. When the amount of one of these minerals in the blood is too high, it will be stored in the bones. To the contrary, when blood levels of the minerals get too low they are transferred out of the bones back into the blood.

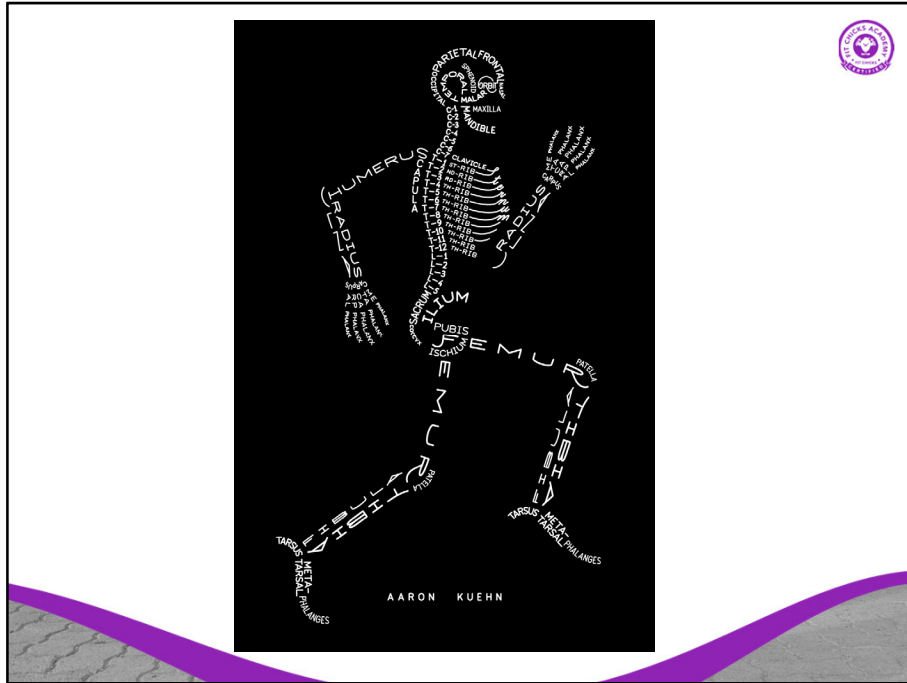
### Endocrine Regulation

- Bone also plays a role in energy metabolism and glucose homeostasis
- <https://www.the-scientist.com/daily-news/endocrine-role-for-skeleton-46225>

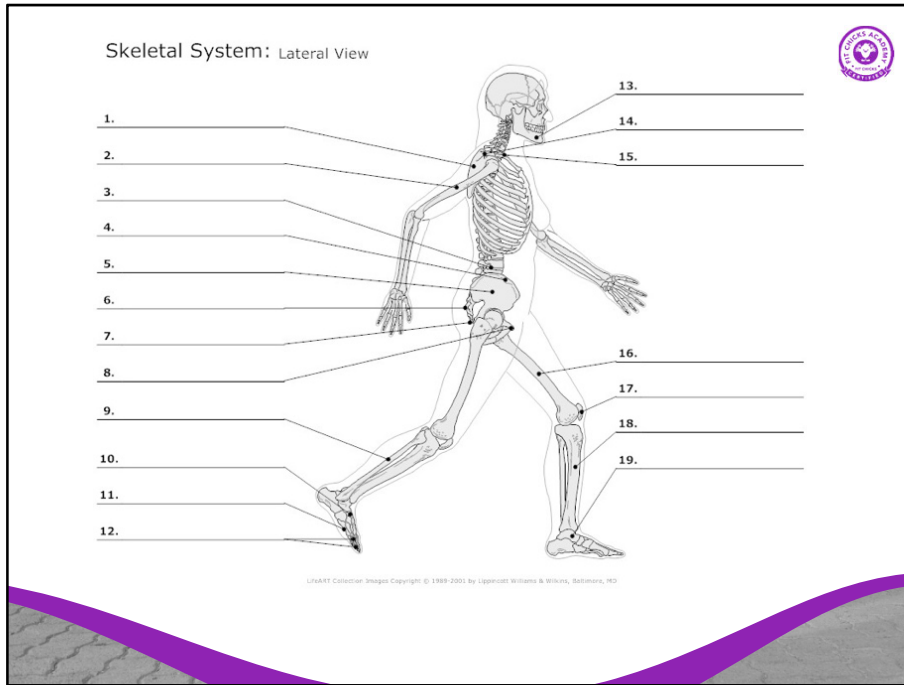


-Go through bones and mention the 'layman's terms for the different ones

- 'clavicle' = 'collar bone'
- Scapula = shoulder blade
- mandible = jaw
- Sternum = breast bone
- Olecranon process of the humerus = funny bone
- Ilium = hip bone
- Ischium = sit bones
- Pubis = pubic bone
- Phalanges = fingers and toes



<https://aaronkuehn.com/art/skeleton-typogram>

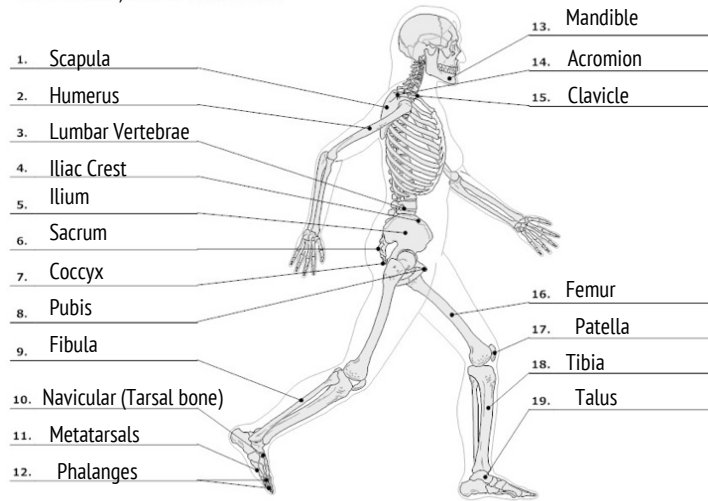


Mention that one of the trickiest things about anatomy is taking the information from a 2 dimensional page to the 3 dimensional body.

Label the diagram




Skeletal System: Lateral View




LIFART Collection Images Copyright © 1989-2001 by Lippincott Williams & Wilkins, Baltimore, MD

## Bone Classification



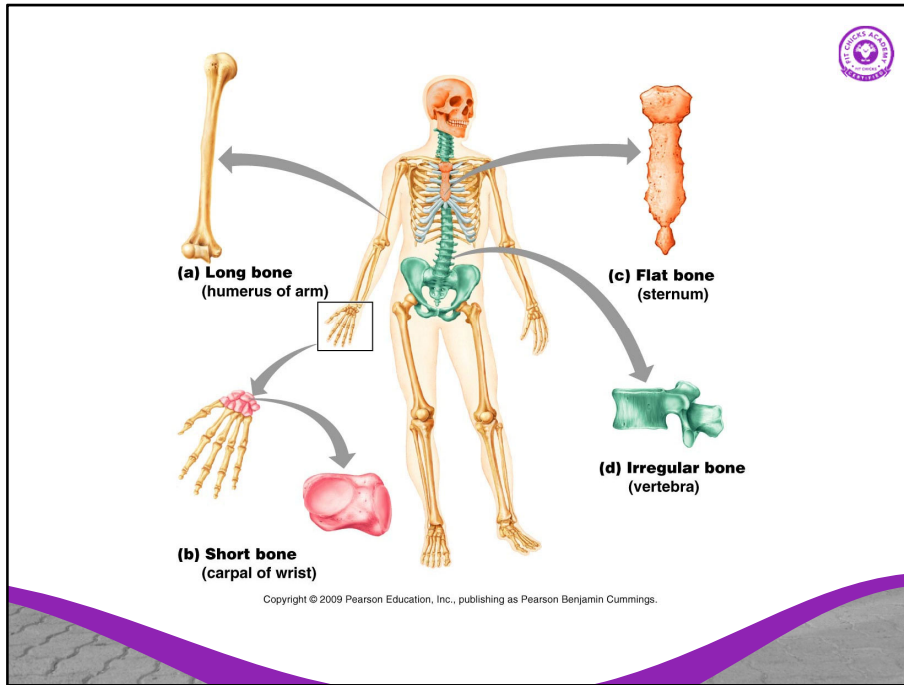
- Long Bones**
  - Relatively long and slender
  - Provide attachment points for muscles to create movement on long levers
  - ex. Femur, Ulna
- Short bones**
  - Small and boxy
  - Give strength and mobility to joints
  - ex. Tarsals and Carpals
- Flat bones**
  - Thin, nearly parallel surfaces
  - Provide a broad site for muscle attachment, protect internal organs
  - Ex. Scapulae, Ribs, Sternum,
- Irregular bones**
  - Complex shapes with short, flat, notched, or ridged surfaces
  - Protection of organs
  - Pelvis, Skull



Long bones: located in the arm, forearm, thigh, leg, palms soles, fingers and toes. The femur is the longest and heaviest bone in the body

The body also has Sesamoid bones

- A bone embedded within a tendon or muscle (ex. Patella, pisiform, two small bones at the base of the 1<sup>st</sup> metatarsal)



<http://droualb.faculty.mjc.edu/Course%20Materials/Elementary%20Anatomy%20and%20Physiology%2050/Lecture%20outlines/skeletal%20system%20I%20with%20figures.htm>

## Bone Markings



### **Bulges, depressions, and holes**

- Sites of attachments for muscles, ligaments, and tendons
- Joint surfaces
- Conduits for blood vessels and nerves

### **Projections:**

#### **Sites of muscle and ligament attachments**

- Tuberosity – rounded projection
- Crest – narrow, prominent ridge
- Trochanter – large, blunt irregular surface
- Line – narrow ridge of bone
- Tubercle – small rounded projection
- Epicondyle – raised area above condyle
- Spine – sharp, slender projection
- Process – any bony prominence

#### **Projections that help to form joints**

- Head – bony expansion carried on a narrow neck
- Facet – smooth, nearly flat articular surface
- Condyle – rounded articular projection
- Ramus – arm-like bar

Tuberosity – deltoid tuberosity – where the deltoid attaches on the humerus

Crest – iliac crest

Trochanter – greater trochanter on the femur

Line – along the shins

Tubercle – infraglenoid tubercle (along the scapula)

Epicondyle – along elbow where ppl often complain of golfers or tennis elbow – flex/ext attach to the epicondyles

Spine – spine of the scapula

Process – spinous process

Head – head of the femur

Facet – facet joints in the spine

Condyle – end of the femur

Ramus – mandible



## Bone Markings

### Depressions and Openings

#### Meatus

- Canal-like passageway
- Ex. Ear

#### Sinus

- Cavity within a bone
- Ex. Nose

#### Fossa

- Shallow, basin-like depression
- Ex. Scapula

#### Groove

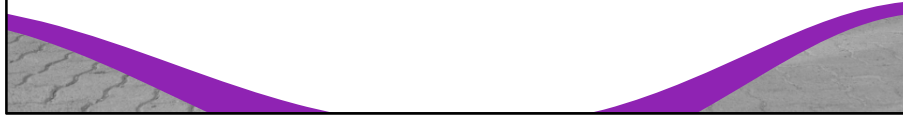
- Furrow
- Ex. Intertubercular (bicipital) groove

#### Fissure

- Narrow, slit-like opening
- Ex. Orbital Fissure

#### Foramen

- Round or oval opening through a bone
- Ex. Vertebrae, orbit, skull



## How Exercise Affects Bones



- Bones are living tissue!
- Weight-bearing activities put stress on the bone causing new tissue to form, making our bones denser and therefore stronger
- Best exercises include:
  - dancing
  - running
  - lifting weights
- Exercises that are NOT as good:
  - bicycling
  - swimming
- Bone strengthening is critical during childhood and the teens as that is when the biggest gains in bone development happen.
- However, as we age, our bones will naturally become less dense. We must maintain the bone density to reduce the risk of osteoporosis

- Os = bone
- extremely porous bones = osteoporosis.
- Osteoporosis can lead to bones that are weak and very likely to fracture.
- Like anything, if we don't use it, we lose it!

[http://www.medicinenet.com/senior\\_exercise/page4.htm](http://www.medicinenet.com/senior_exercise/page4.htm)

<https://www.nichd.nih.gov/health/topics/bonehealth/conditioninfo/Pages/activity.aspx>

## Joint Structure and Movement



### Joint

- Also known as an Articulation
- Where bones meet
- Where movement occurs
  - Varies depending on the anatomical structure of the joint
- Articulations are categorized by their range of motion (ROM)

### Range of motion (ROM)

- The amount of movement permitted at the joint

Categorized by their rom or the amount of movement at the joint

<https://en.oxforddictionaries.com/definition/mobility>

## Joint Structure and Movement



Functional Category (degree of movement)	Structural Category	Description	Example
Synarthrosis (no movement)	Fibrous Suture	A fibrous connection plus interlocked surfaces	Skull, teeth in sockets
	Fibrous Gomphosis	A fibrous connection plus insertion in a bony socket	Between the teeth and jaws
	Cartilaginous Synchondrosis	Interposition of a cartilage plate	Between the first rib and sternum
Amphiarthrosis (little movement)	Fibrous Syndesmosis	Bones are connected by a ligament	Between the tibia and fibula (inferior joint)
	Cartilaginous Symphysis	Bones are connected by a wedge or pad of fibrocartilage	Between the right and left halves of the pelvis
Diarthrosis (free movement)	Synovial	Bounded by joint capsules, contain synovial fluid	knees, ankles, shoulders (Subdivided by ROM)

Synarthrosis – the bony edges are close together and may interlock. Extremely strong joints where you don't want any movement

Amphiarthrosis – more movement than a synarthrosis but much stronger than a freely movable joint. Connected by collagen fibers or cartilage

Fibrous - Bones joined by fibrous tissue. Little to no movement

Cartilaginous - Joined by cartilage, a little bit of movement but not much

Synovial – contains synovial fluid, freely moveable

Martini, F.H., Ober, W.C., Bartholomew, E.F., Nath, J.L. (2013). Visual Essentials of Anatomy and Physiology. 191





## Synovial Joint Sub Classification


Type	Details	Example
Hinge	Back and forth	Knees, Elbows
Condyloid	Back and forth and side to side	Wrists, Ankles
Ball and Socket	All planes of movement	Shoulders, Hips

[http://en.wikipedia.org/wiki/Synovial\\_joint](http://en.wikipedia.org/wiki/Synovial_joint)

Components of a synovial joint: the articulation itself, ligaments, synovial membrane, bursae, synovia

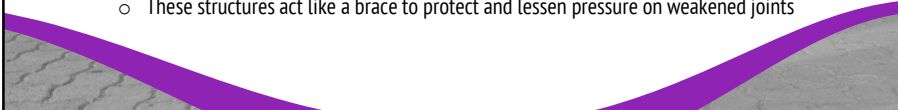
There are actually 7 types of synovial joints but these are the ones most relevant to a Personal Trainer

[http://en.wikipedia.org/wiki/Synovial\\_joint](http://en.wikipedia.org/wiki/Synovial_joint)



## How Exercise Affects the Joints

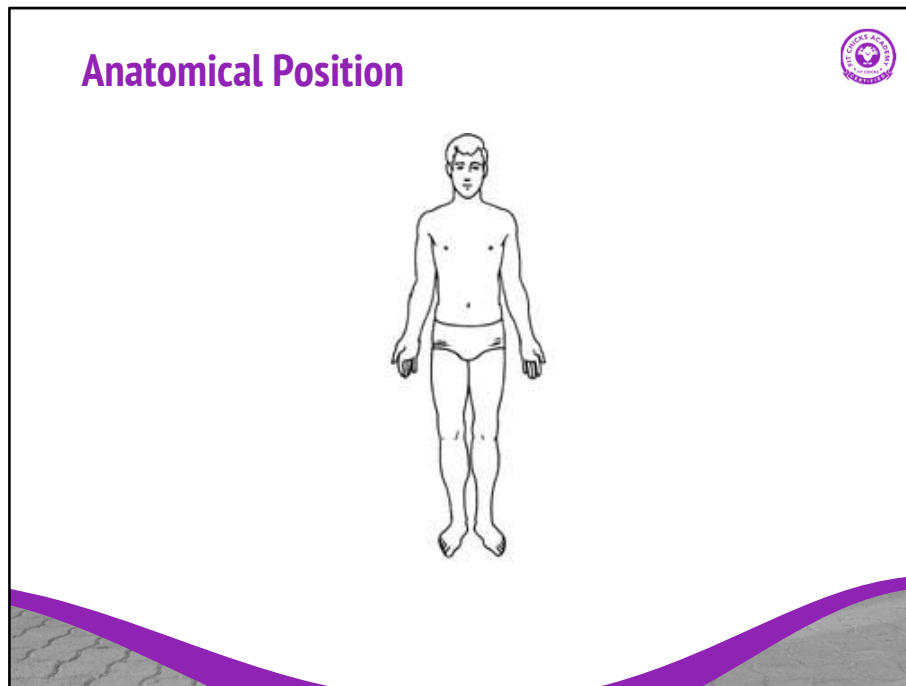
- **Synovial fluid lubricates the joint**
  - Physical activity encourages circulation of the fluid
- **Blood flow increases throughout the body, including the joints**
  - The synovial membrane is exposed to a steady supply of nourishing oxygen and nutrients
- **Nutrients circulate to the joint**
  - Weight bearing exercises force water molecules in/out of the cartilage like a sponge bringing oxygen and nutrients to the joint
- **Joint-repair genes are switched on**
  - Joint movement activates genes associated with rebuilding cartilage
- **Cellular waste is removed**
  - Exercise triggers autophagy - a biological process where damaged cells in the joint are broken down and removed
- **Muscle is built**
  - Exercise strengthens the muscles, ligaments and tendons surrounding the joints
  - These structures act like a brace to protect and lessen pressure on weakened joints



[Http://blog.arthritis.org/living-with-arthritis/exercise-benefits-for-joints/](http://blog.arthritis.org/living-with-arthritis/exercise-benefits-for-joints/)

Synovial fluids acts like oil in an engine, allows your bones to move past one another more smoothly

Scientists aren't entirely clear about how genes play a role in joint repair  
(Overdoing exercise can have the opposite effect)



<https://www.youtube.com/watch?v=kvHWnJwBkmo>

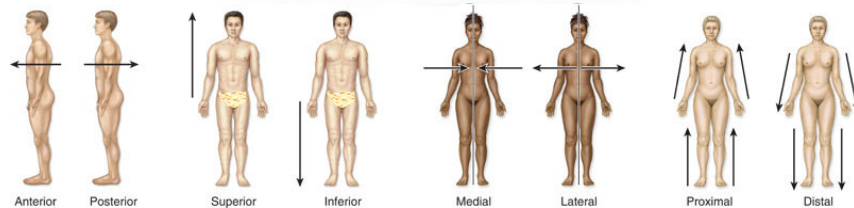
**Anatomical position:** The position with the body erect with the arms at the sides and the palms forward. The anatomical position is of importance in anatomy because it is the position of reference for anatomical nomenclature. Anatomic terms such as anterior and posterior, medial and lateral, abduction and adduction, and so on apply to the body when it is in the anatomical position.

<http://www.medicinenet.com/script/main/art.asp?articlekey=24762>

## Anatomical Terms



- Anterior/Posterior
- Superior/Inferior
- Medial/Lateral
- Proximal/Distal
- Supine/Prone
- Dorsal/Plantar



<https://www.youtube.com/watch?v=kvHWnJwBkmo>

- Anterior/Posterior (front and back)
- Medial/Lateral (towards and away from midline) – medial = middle
- Superior/Inferior (above and below)
- Supine/Prone (On your back, on your front). – supine = on your spine
- Dorsal/Plantar (of the feet, top and bottom) – dorsal fin of a shark is on the top of the sharks body/plantar = plant your foot on the ground
- Proximal/Distal (appendages, towards the trunk and away)

## Planes of Movement



### Sagittal Plane

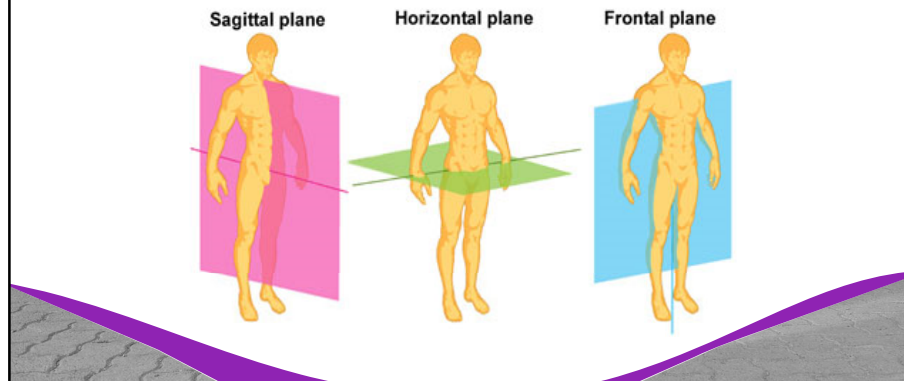
- Separates the body into right and left halves

### Horizontal or transverse plane

- Separates superior and inferior portions of the body

### Frontal or coronal plane

- Separates anterior and posterior portions of the body



The sagittal plan can also be subdivided into:

Midsagittal – passes through the midline of the body, dividing it into equal right and left halves

Parasagittal – a cut parallel to the midsagittal plane, separates the body into right and left halves of unequal size.

What are some movements in each plane?

Sagittal – shoulder flexion, trunk ext, hip flexion

Horizontal – trunk rotation,

Frontal – shld abduction, hip adduction, trunk lateral flexion

<https://www.teachpe.com/anatomy-physiology/the-skeleton-bones/planes-of-movement>

Martini, F.H., Ober, W.C., Bartholomew, E.F., Nath, J.L. (2013). Visual Essentials of Anatomy and Physiology.

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## Joint Movement Terminology

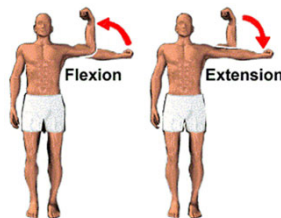


### Flexion:

- Refers to movement where the angle between two bones decreases. Flexion is commonly known as bending.

### Extension:

- Refers to movement where the angle between two bones increases. Extension is otherwise known as straightening.



Totally zen video about joint movement terminology:

<https://www.youtube.com/watch?v=5YcNAPzDxDg>

London bridge fast version:

<https://www.youtube.com/watch?v=oA6HiaV1RIU>

Normal version: <https://www.youtube.com/watch?v=-GCgaoRdeaU>

Great resource for articulations with respect to EXERCISES:

<http://www.exrx.net/Lists/Articulations.html>

## ABduction and ADduction

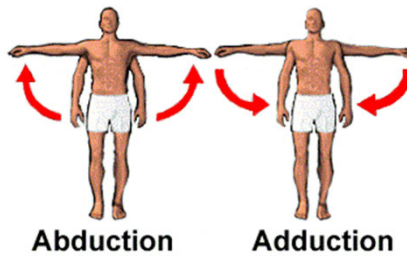


### **Abduction:**

- Is movement of a body segment away from the midline of the body.

### **Adduction:**

- Is movement of a body segment toward the midline of the body.

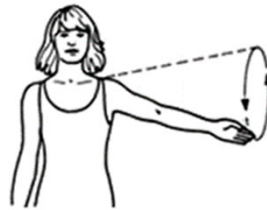


For adduction, think “adding the body parts together”



## Circumduction

This is a movement where the joint is the pivot and the body segment moves in a combination of flexion, extension, adduction and abduction.



Circumduction



## Protraction and Retraction

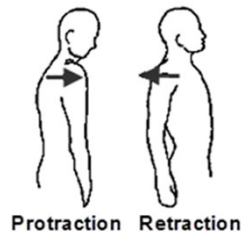


### **Protraction:**

- This is forward movement of the scapula that results in 'hunching' of the shoulders.

### **Retraction:**

- This is backward movement of the scapula as they pull together to 'square' the shoulders and push the chest out.



The jaw is another good example of protraction and retraction – Protraction = pushing your lower jaw forward and Retraction = pulling your lower jaw back

## Supination and Pronation



### Supination:

- Hand – movement so the palm of the hand faces upward or forward (anteriorly).
- Foot – combination of inversion, plantar flexion and adduction of the foot occurring at the same time.

### Pronation:

- Hand – movement so the palm of the hand faces downward or backward (posteriorly).
- Foot – combination of eversion, dorsiflexion and abduction of the foot occurring at the same time.



Easy way to remember this one – for supination you are holding a bowl of soup so your palm needs to be up.

## Plantar Flexion and Dorsiflexion

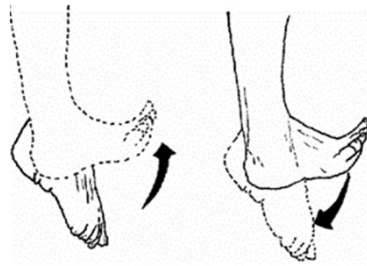


### **Plantar Flexion:**

- Is moving the top of the foot away from the shin or 'pointing' the toes.

### **Dorsiflexion:**

- Is moving the top of the foot toward the shin or 'raising' the toes.



## Inversion and Eversion

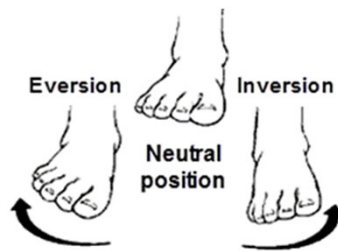


### **Inversion:**

- Is the movement of the foot to bring the sole of the foot to face inward.

### **Eversion:**

- Is the movement of the foot to bring the sole of the foot to face outward.



Inversion – bottom of foot faces in – inversion sprains are most common, usually when you roll your ankle, you invert it.

## Medial and Lateral Rotation

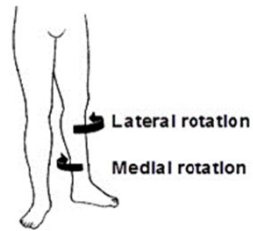


### **Medial (Internal) Rotation:**

- The movement of a body segment where the front (anterior) of the segment rotates medially (inwards) towards the midline of the body.

### **Lateral (External) Rotation:**

- The movement of a body segment where the front (anterior) of the segment rotates laterally (outwards) away from the midline of the body.



## Joint Movement Terminology



What movements did her shoulders, wrists, hips, knees and ankles do from anatomical position?



Shoulder flexion, wrist pronation, hip flexion, knee flexion, ankle dorsiflexion

Now tell them to flex both shoulders, hyperextend their left hip and flex their right hip. they should end up in Warrior 3



<https://www.youtube.com/watch?v=5YcNAPzDxDg>

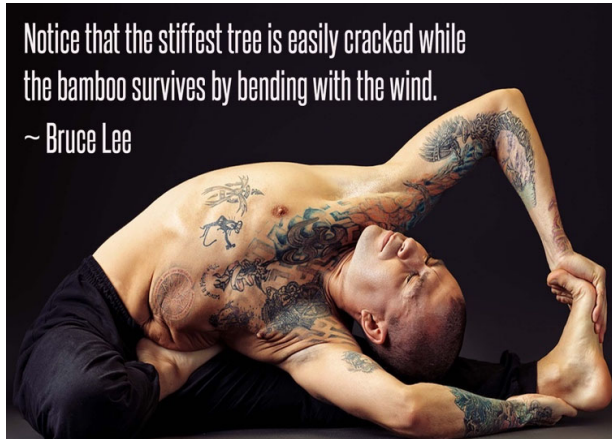
<http://www.exrx.net/Lists/Articulations.html>

## Flexibility



Notice that the stiffest tree is easily cracked while  
the bamboo survives by bending with the wind.

~ Bruce Lee





## Flexibility

**What is flexibility?**

- The ability of a muscle or group of muscles to lengthen passively through a range of motion
- Known as 'static stretching'

**Mobility**

- The ability to move a joint actively through a range of motion.
- Know as dynamic stretches
- Often done by athletes prior to their workout.

<https://kinstretch.com/difference-mobility-flexibility/>

Just because a muscle can achieve a full length doesn't mean the joint it attaches to is mobile.

Example – someone can't touch their toes bc their hamstring feel really 'tight" but laying supine in a passive stretch they can achieve normal muscle length. This person has adequate muscle length but lacks joint mobility to achieve a toe touch. There are other muscles affecting the joint limiting the mobility.

## Benefits of Flexibility Training

- Improved ROM (Range of Motion)/Mobility at joints
- Increase in athletic performance and helps in daily living
- Decrease risk of injury
- Better posture and possible relief of back pain
- Feelings of tension release, relaxation and restoration

*NOTE: There is no scientific evidence to prove that stretching aids in exercise-induced muscle soreness or recovery*

Photo by iStockphoto.com



Give examples:

- My grandmother who can't tie her shoes
- someone who moves quickly and pulls a tight muscle
- tight hamstrings pulling the pelvis out of alignment, leading to back pain.

<http://www.livestrong.com/article/332519-what-are-the-benefits-of-good-flexibility/>



FIGURE 2.1: POINTS OF FLEXIBILITY



## Assessing Flexibility

### Standardized Tests

#### Shoulder Flexibility test

- Excellent = Fingers overlap
- Good = Fingers touch
- Average = Fingers are less than two inches apart
- Poor = Fingers are more than two inches apart



#### Sit and Reach test

- Tests hamstrings and lower back
- Feet at 26cm
- Reach forward and hold for at least 2 secs
- Repeat



Sit and reach stretch.

Other Flexibility Tests:

<http://www.exrx.net/Lists/Tests.html>

<http://www.exrx.net/Lists/Tests.html> (tons of other flexibility tests)

One test that I always do with my clients is a deep squat test. If someone isn't able to get into a deep squat then it will tell you a lot about their flexibility and mobility. Is it tight hips, back, ankles.... So many fun things to work on!!

<https://www.youtube.com/watch?v=uBrF5VfxrmM> Sit and Reach test



**Table 3** Sit-and-Reach Flexibility Norms and Percentiles (%ile) in Canadian Men (M) and Women (W) Ages 15–69

Age (y)	%ile	15–19		20–29		30–39		40–49		50–59		60–69	
		M	W	M	W	Sit and Reach (cm) <sup>a</sup>		M	W	M	W	M	W
High	81–100	38	42	39	40	37	40	34	37	34	38	32	34
>Ave	61–80	34–38	38–42	34–39	37–40	33–37	36–40	29–34	34–37	28–34	33–38	25–32	31–34
Ave	41–60	29–33	34–37	30–33	33–36	28–32	32–35	24–28	30–33	24–27	30–32	20–24	27–30
<Ave	21–40	24–28	29–33	25–29	28–32	23–27	27–31	18–23	25–29	16–23	25–29	15–19	23–26
Low	1–20	24	29	25	28	23	27	18	25	16	25	15	23

Note: <sup>a</sup>Index line (heel-line) is at 26 cm.  
From Fitness and Lifestyle in Canada, Fitness and Lifestyle Research Institute, 1983. Fitness and Amateur Sport, Ottawa, Canada.

Good for course notes, although the image is referenced...

## FITT for Flexibility Training

### Frequency

- It's recommended that you perform flexibility training once a day for 3-7 days a week
- Ideally, flexibility training should be performed AFTER the workout, as the muscles are warm and most pliable

### Intensity

- Your flexibility program should feel like slight tension with NO PAIN. It should never hurt!

### Time

- Hold each stretch for a minimum of 30 seconds (or 6 deep breaths)

### Type

- Static stretching
- Mobility/Dynamic stretching
- It is recommended that everyone does flexibility training as part of their daily routine
- Athletes may choose to incorporate some mobility training prior to their workout.



- <http://www.sportscience.co/flexibility/how-often-and-how-long-should-i-stretch-to-improve-flexibility/>

## What is Dynamic Stretching?



- Also known as “moving stretches”.
- Typically performed in a warm up to warm up the muscles and stretch them to prepare for the exercise ahead
- Reduce injuries
- Great to improve functional range of motion

Examples include:

- Arm circles
- Light jog
- Side to side lunges
- Hip circles
- 90/90 rotations
- Squat to stand



### Dynamic Stretching

Dynamic stretching is also known as “moving stretches”. These stretches are typically performed in a warm up to warm up the muscles and stretch them to prepare for the exercise ahead and reduce injuries.

Dynamic stretches are also great in addition to doing in a warm up to help improve functional range of motion, mobility in sports and in performing everyday activities.

Dynamic stretching is similar to active stretching. However, in dynamic stretching you don't hold the stretch. You are always moving or dynamic

Note that dynamic stretching should not be confused with old-fashioned ballistic stretching (remember the bouncing toe touches from PE classes?). Dynamic stretching is controlled, smooth, and deliberate, whereas ballistic stretching is uncontrolled, erratic, and jerky. Although there are unique benefits to ballistic stretches, they should be done only under the supervision of a professional because, for most people, the risks of ballistic stretching far outweigh the benefits.

<http://www.humankinetics.com/excerpts/excerpts/types-of-stretches>

## Advancing a Flexibility Program



- Hold stretch for longer
- Go deeper
- Change your relationship to gravity
  - Standing hip stretch vs a lying down 'Figure 4' to a Pidgeon pose
- Add multiple joints
  - Stretching your triceps while you do a hip flexor stretch
- Introducing some light resistance from a partner
- Add a balance element
  - Lying quadriceps vs standing quadriceps



Like any element of fitness, you have to apply the principle of progressive overload to continue to see improvements.



## Flexibility Resources



- Strength Training Anatomy:
  - p. 60: The shoulder (Deltoids)
  - p. 63 The Chest (Pectoralis Major)
  - p. 89 The Back (Latissimus Dorsi)
  - p. 120-121 Neck and Shoulders (Upper Trapezius, Deltoids)
  - p.139 Quadriceps
  - p. 163 Glutes and Hamstrings
- Yoga poses by Anatomy:
  - <http://www.yogajournal.com/category/anatomy/>
  - Becoming a Supple Leopard by Dr. Kelly Starrett

# Recap



## INTRODUCTION TO THE FITT PRINCIPLE

### SKELETAL ANATOMY

- Know your bones!
- Review your articulations and Anatomical terms.

### FLEXIBILITY

- Benefits of Flexibility Training
- Assessing Flexibility
- Designing a Flexibility Training Program

## WHAT'S COMING UP IN NEXT CLASS?

### MUSCLES!!





**Any questions or inquiries,  
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**Let's have an amazing journey  
ahead!**

