

# Foot Health Information

## Orthotic Foot Treatment

Walk With No Pain, Walk In Comfort.

Service Hotline: 0424215789 02-98265797

**FOOT BIO-TEC®**

# Introduction



- ▶ The foot is the foundation of the body, much like a foundation to a building.
- ▶ The foot, however, is significantly more complex and dynamic than is a stationary foundation of a building.
- ▶ The foot is to support the body and to fulfil the walk.
- ▶ We averagely walk 3,000 to 5,000 steps a day.
- ▶ For a healthy life we should aim to walk up to 10,000 steps a day. When walking the foot takes vertical pressure of nearly 1.5 time of the body weight.
- ▶ When we run the foot takes vertical pressure of nearly 3 times of your body weight.

# Introduction

- ▶ Walking is not just a daily activity for human, but can also help reduce our risk of the following common health problems:
  - Heart disease
  - Obesity
  - Diabetes
  - High blood pressure
  - Depression



# Introduction

- ▶ The foot takes the major workload of the body. However, studies show that the foot is least taken care of by human.
- ▶ 90% of the shoes a lady has bought are either too narrow or too small shoes or too high heeled shoes or with a too narrow toe box, which are all unhealthy.
- ▶ Less than 10% of population in western countries take care of their foot by wearing healthy shoes.
- ▶ Less than 0.6% of population in Asian countries wear healthy shoes.

# Introduction

- ▶ Wearing narrow, high heeled and/or pointed shoes makes you look feminine but will lead extremely unhealthy outcome to their foot, like bunions, ball of the foot pain, interphalangeal neuroma, painful corns and callus, achilles tendonitis, knee pain, hip pain (forward pelvic tilt) and lower back pain (lumbar lordosis) , etc.
- ▶ However, people's nature is to care about their looks first before looking after their health.



# Introduction

- ▶ Studies show that even for diabetic patients who were given specifically designed shoes to prevent the diabetic foot ulcers did not adhere to wearing healthy shoes.
- ▶ 85% of these patients gave up wearing diabetic shoes because of the looks by risking to develop the life-threatening diabetic foot ulcers.
- ▶ Our feet are exquisitely sophisticated & often overlooked & under-appreciated work-horse in our daily life.
- ▶ Therefore, it is extremely important to educate people about the health of the foot.

# Anatomy of the foot

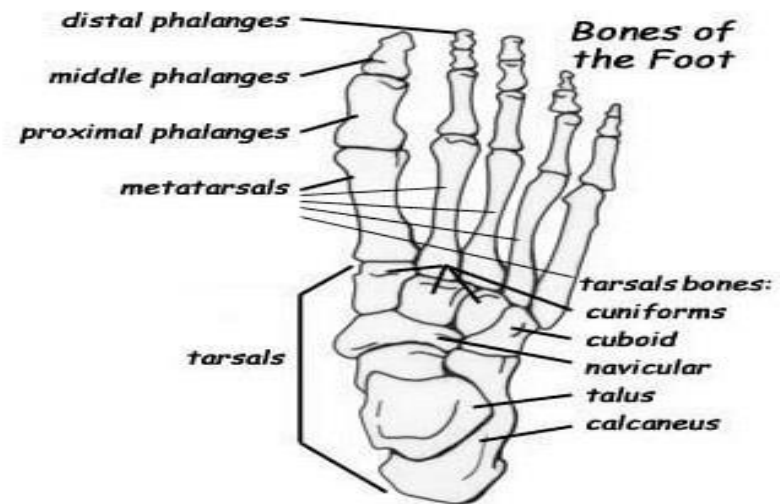
- ▶ The human foot and ankle is a strong and complex mechanical structure containing exactly 26 bones, 33 joints (20 of which are actively articulated), and more than a hundred muscles, tendons, and ligaments.
- ▶ A good foot foundation is also very important for the good health of many of our higher up joints, including our ankle joints, knee joints, hip joints, back and even shoulder joints.



# Anatomy of the foot



**The Foot**  
*Skeletal*





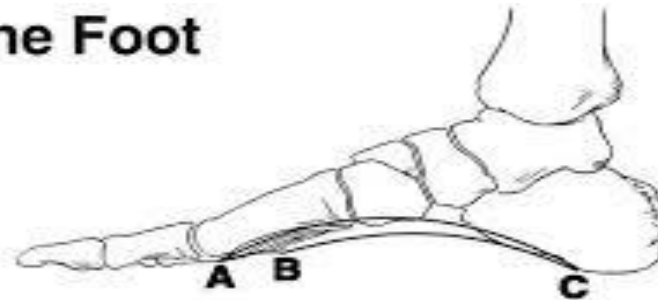
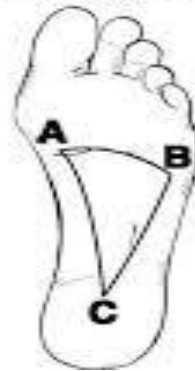
# Anatomy of the foot

- ▶ The importance to our bodies of having correctly aligned feet is further illustrated by the fact that a faulty foot foundation (incorrect foot biomechanics) may cause avoidable and unnecessary wear & damage to other important joints including to each of our ankle joints, knee joints, hip joints, back and shoulder joints.

# Anatomy of the foot

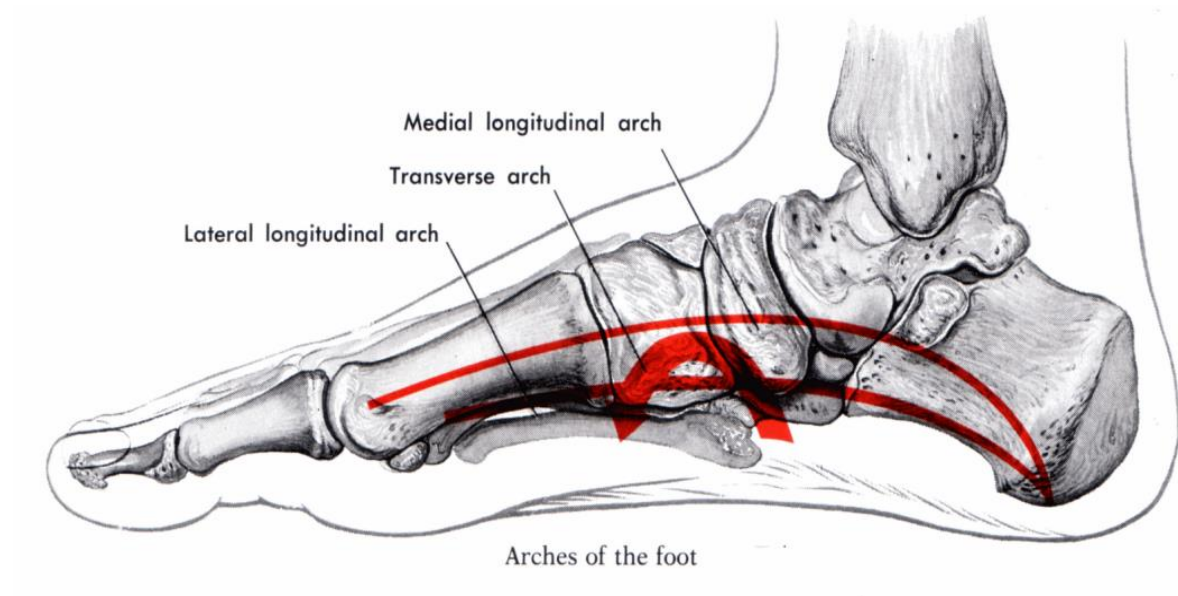
The foot foundation is mainly structured with 3 major arches. In another word, these three arches form the foundation of the foot.

## Arches of the Foot



A-B Anterior Transverse Arch  
B-C Lateral Longitudinal Arch  
A-C Medial Longitudinal Arch

# Anatomy of the foot



# Anatomy of the foot

- ▶ The human foot has two longitudinal arches and a transverse arch maintained by the interlocking shapes of the foot bones, strong ligaments, and pulling muscles during activity. The slight mobility of these arches when weight is applied to and removed from the foot makes walking and running more economical in terms of energy. As can be examined in a footprint, the medial longitudinal arch curves above the ground. This arch stretches from the heel bone over the "keystone" ankle bone to the three medial metatarsals.

# Anatomy of the foot

- ▶ In contrast, the lateral longitudinal arch is very low. With the cuboid serving as its keystone, it redistributes part of the weight to the calcaneus and the distal end of the fifth metatarsal. The two longitudinal arches serve as pillars for the transverse arch which run obliquely across the tarsometatarsal joints. Excessive strain on the tendons and ligaments of the feet can result in fallen arches.

# Anatomy of the foot

## ► Major joints of the foot

1. Sub-talar joints-Calcaneus and Talus
2. Ankle joint-Talus and Tibia
3. Metatarsophalangeal joint
4. Inter-tarsal joint
5. Inter-phalangeal joint

# Anatomy of the foot

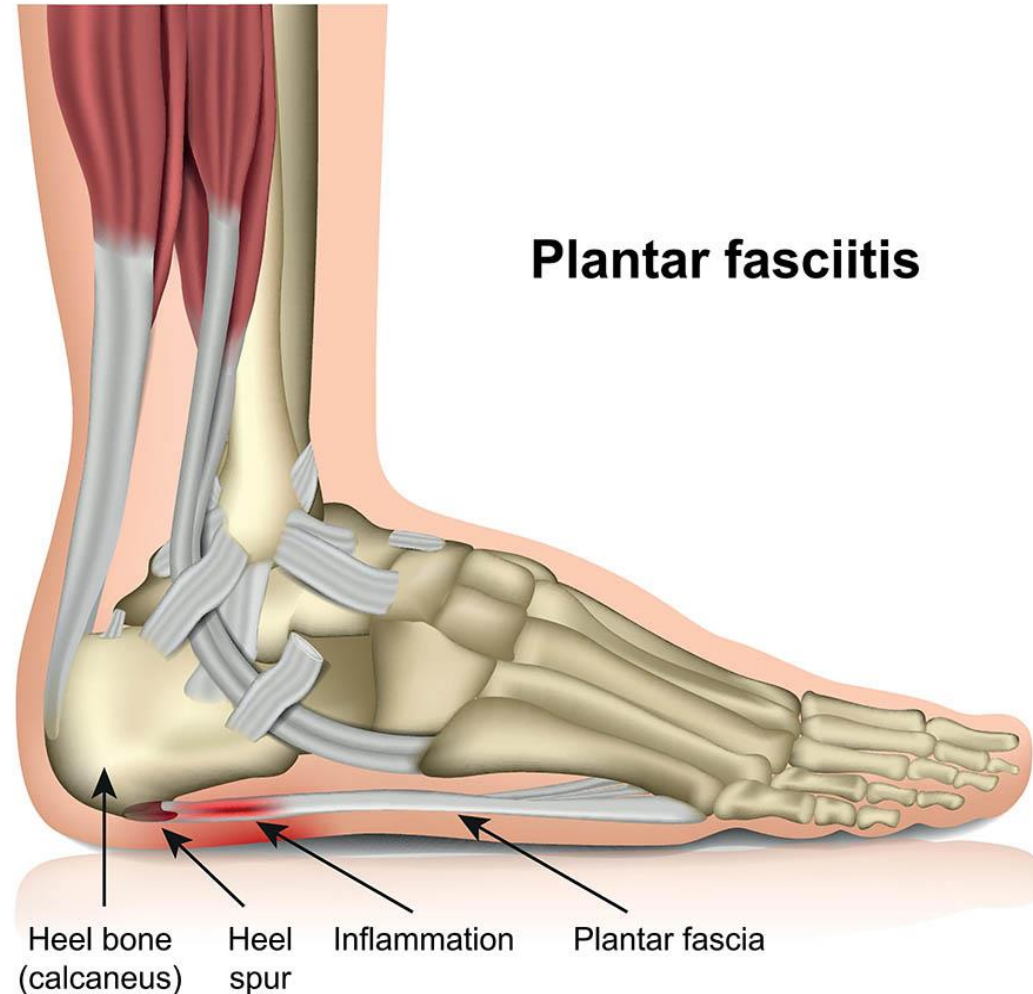




# Anatomy of the foot

## ► Major Soft Tissue

1. Achilles Tendon
2. Plantar Fascia
3. Fatty Pad
4. Cartilage
5. Muscles-intrinsic/extrinsic



# Anatomy of the foot

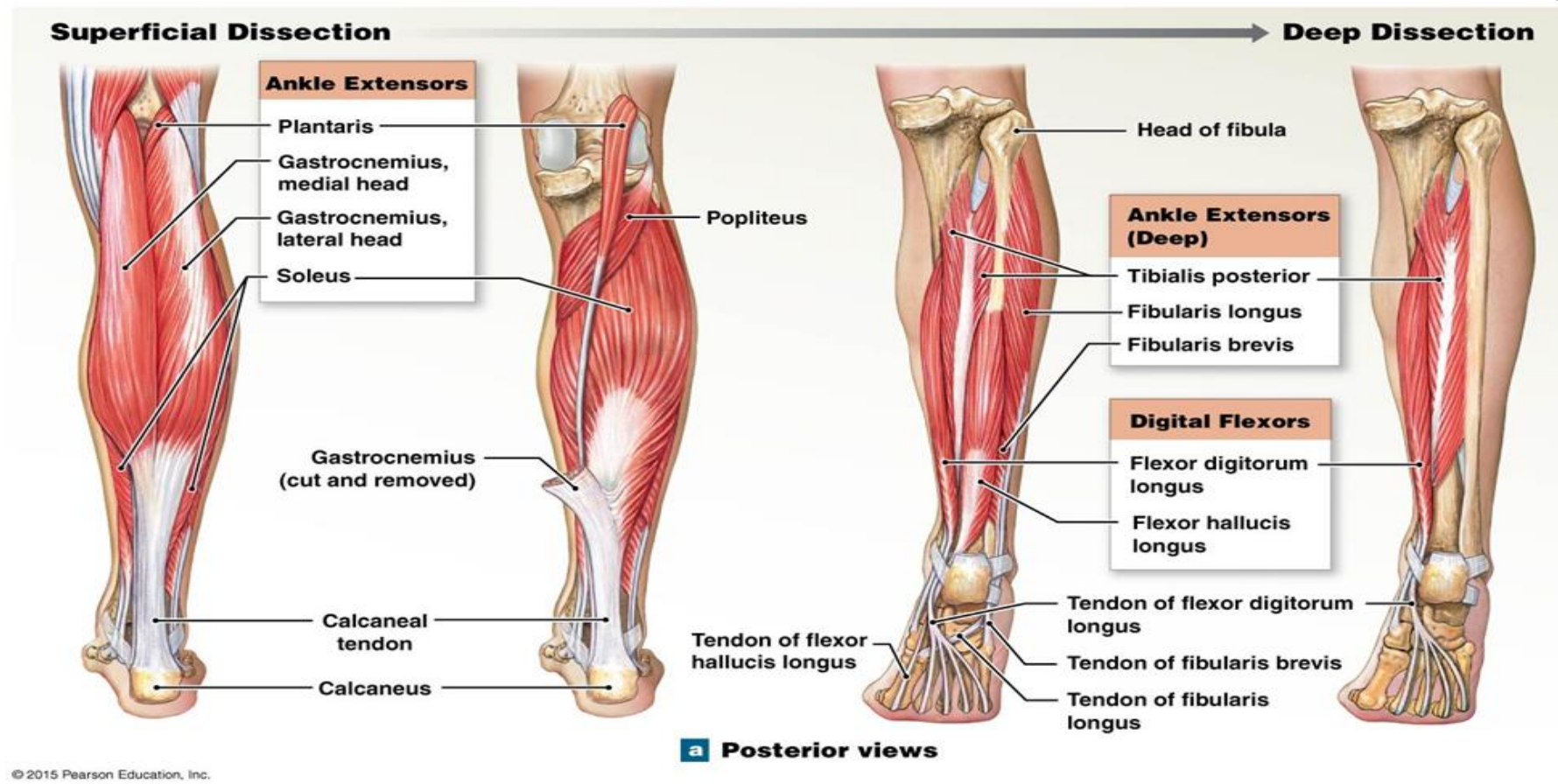
► The Extrinsic Muscles of the Foot and Ankle are:

- Soleus.
- Gastrocnemius medial and lateral heads.
- Tibialis Posterior.

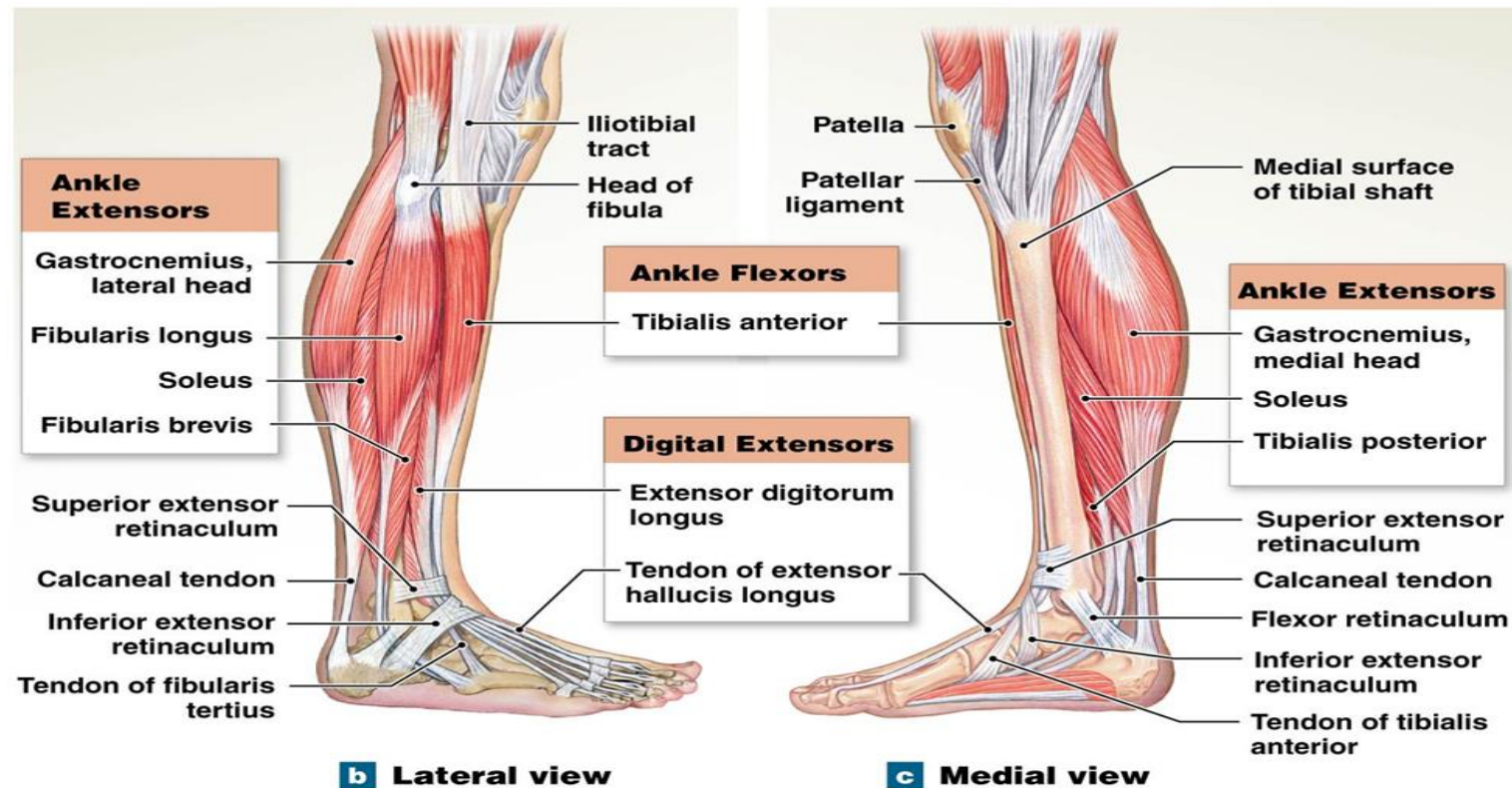
# Anatomy of the foot

- **Extrinsic Muscles of the Foot and Ankle-Continue**
- Extensor Digitorum Longus.
- Extensor Hallucis Longus.
- Flexor Digitorum Longus.
- Flexor Hallucis Longus.
- Peroneus Longus.

# Anatomy of the foot-extrinsic foot muscles



# Anatomy of the foot-extrinsic foot muscles



# Anatomy of the foot

## ► The intrinsic muscles include:

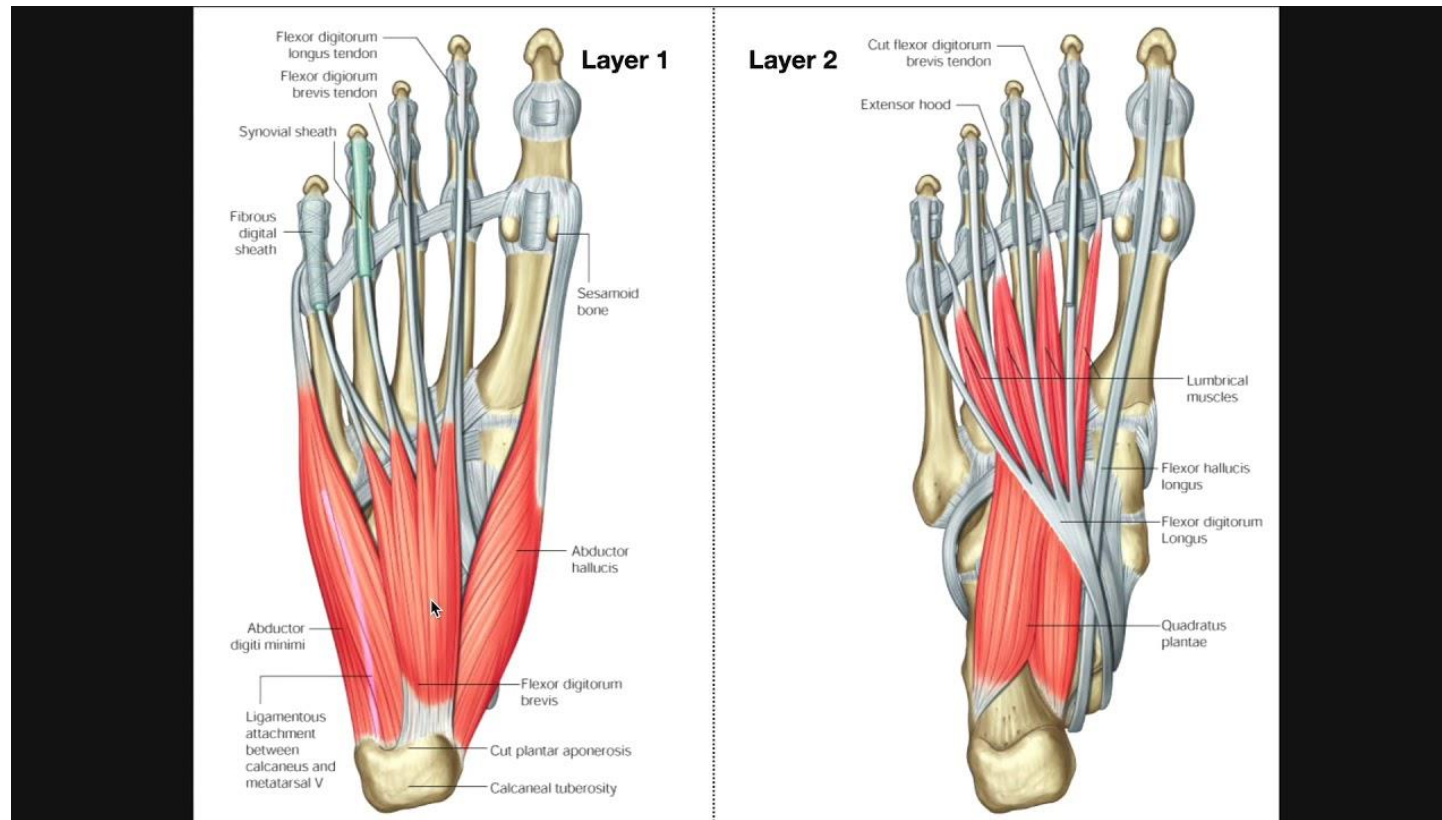
- Abductor Hallucis.
- Quadratus Plantae.
- Flexor Hallucis Brevis.
- Flexor Digitorum Brevis.
- .

# Anatomy of the foot

- Adductor Hallucis.
- Abductor Digiti Minimi.
- Flexor Digiti Minimi.
- The Interossei Muscles



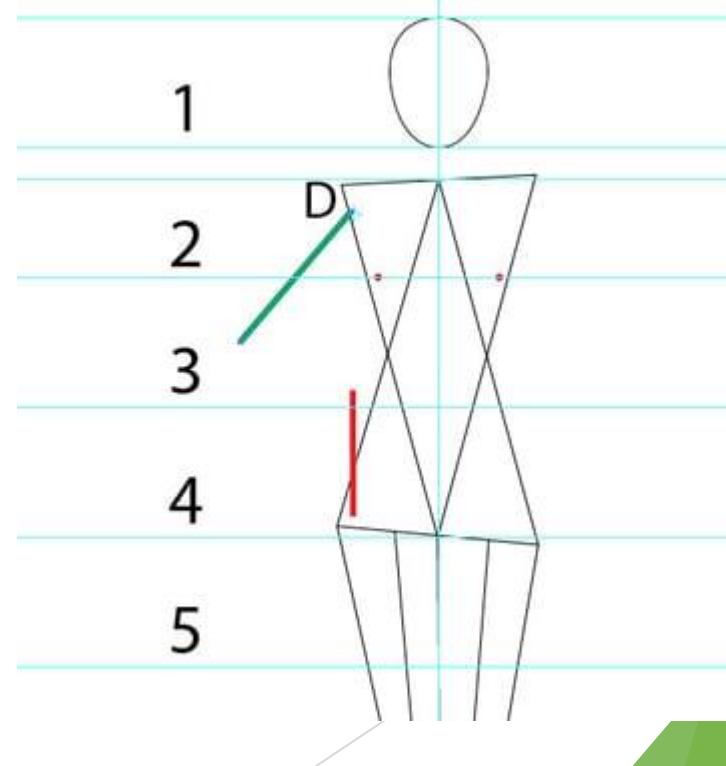
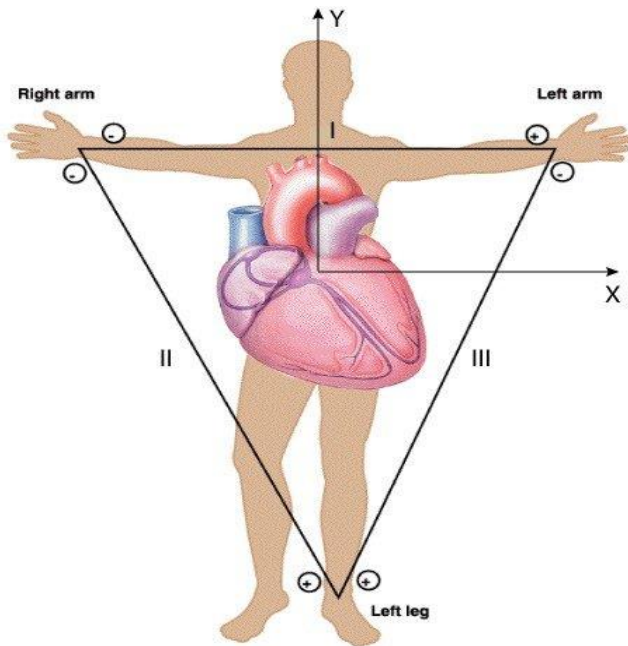
# Anatomy of the foot-extrinsic foot muscles





# Foot biomechanics

- ▶ Human body is basically structured as a triangle. There are many triangles in human body.
- ▶ Triangle is the most stable form in physics. Human body must maintain a dynamic state of triangle to stay stable.



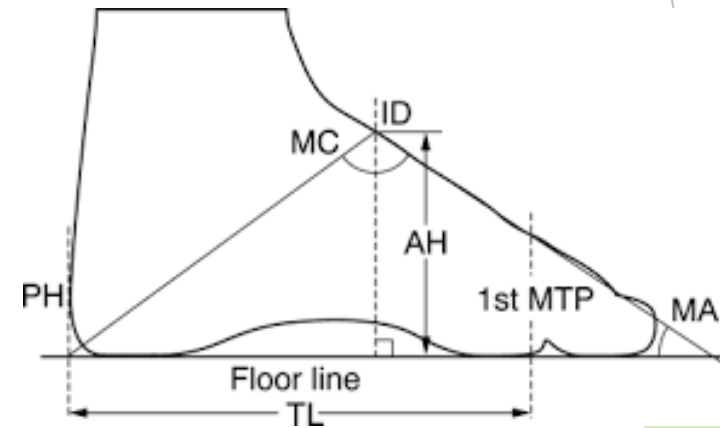
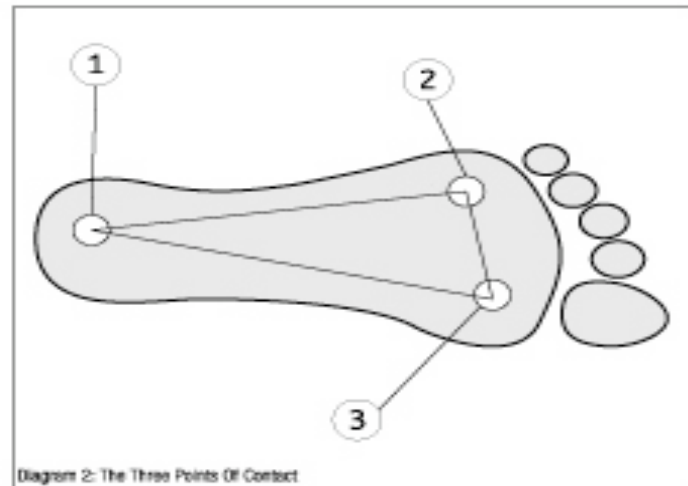
# Foot biomechanics



# Foot biomechanics

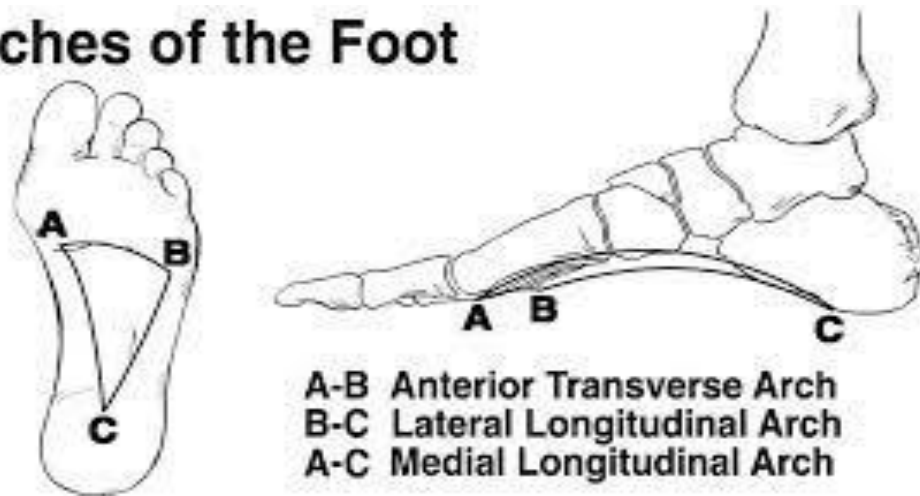
- ▶ In foot there are 4 major triangles.
- ▶ Medial longitudinal arch
- ▶ Lateral longitudinal arch
- ▶ Transverse arch
- ▶ Plantar plane of the foot is a triangle.

# Foot biomechanics



# Foot biomechanics

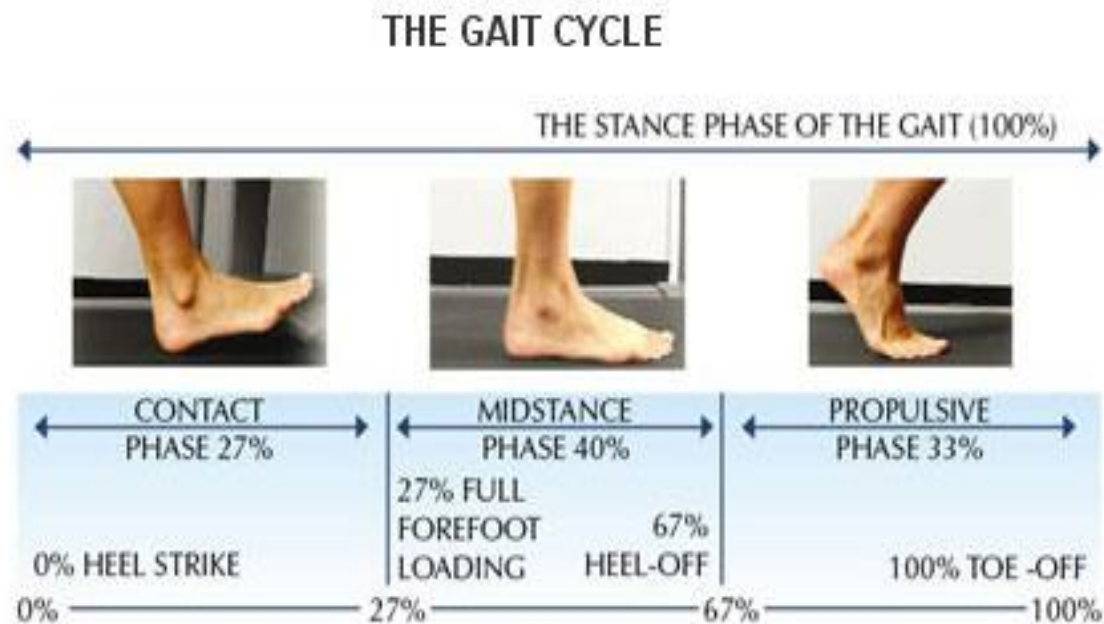
## Arches of the Foot



# Foot biomechanics

- ▶ When the foot arch collapses the triangle starts to disappear and the stability of the body begins to diminish.
- ▶ Foot over-pronation is the reflection of disappearance of the major medial longitudinal arch, therefore, is the cause of a series of problems in the foot and the lower limb.

# Foot biomechanics



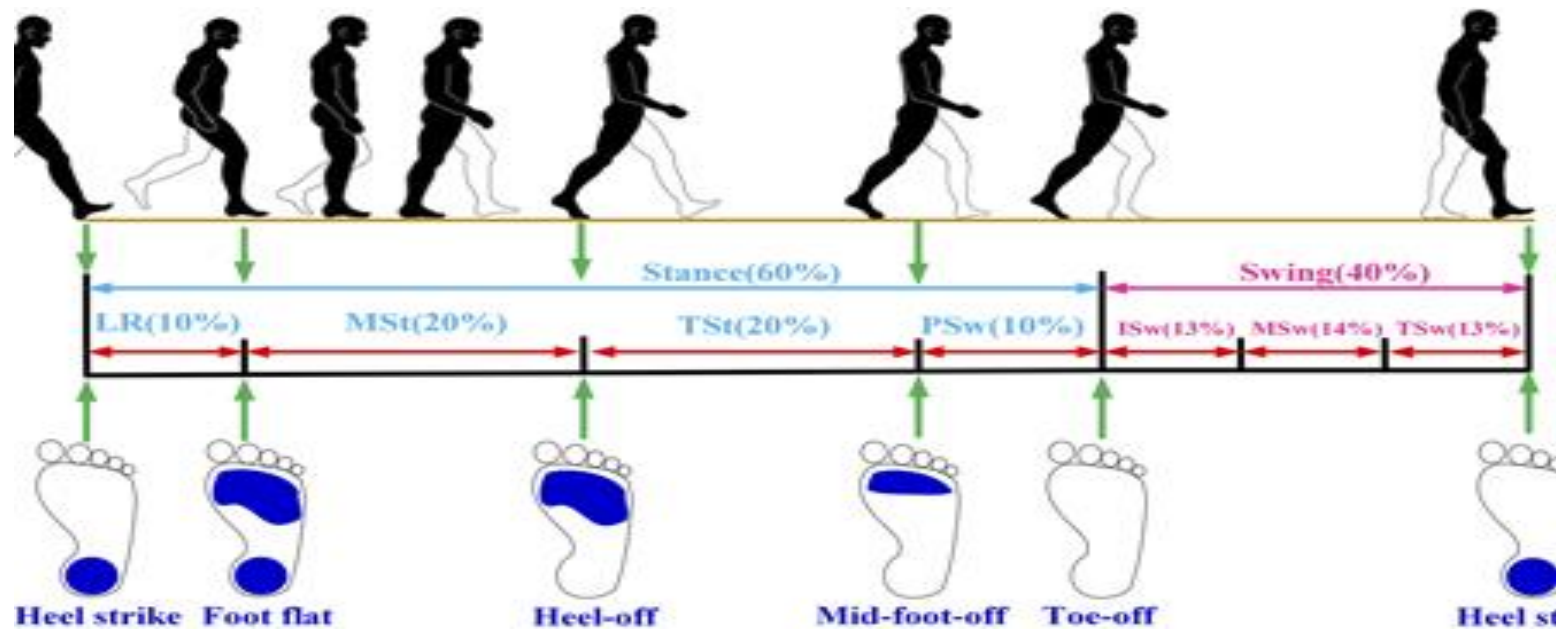


# Foot biomechanics

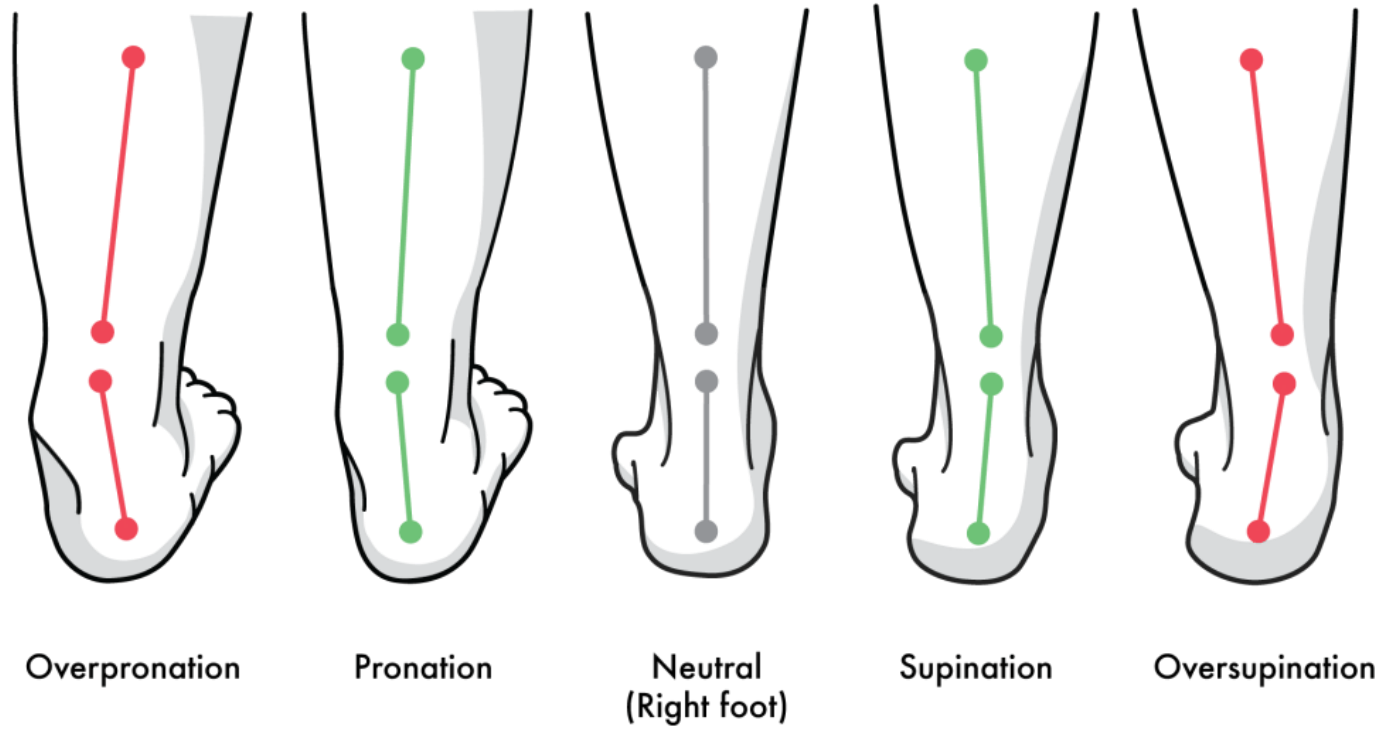
Walking is completed through a series of gait cycles. To fulfill a normal gait cycle, the foot will normally pronate and supinate within the normal range of 4-6 degrees.

- The foot will strike with the heel on the ground as the first touch, then pronate to absorb the body weight and the ground counter force, followed by toe-off action (supination) to propel the foot and the body off the ground.

# Foot biomechanics



# Foot biomechanics



# Foot biomechanics

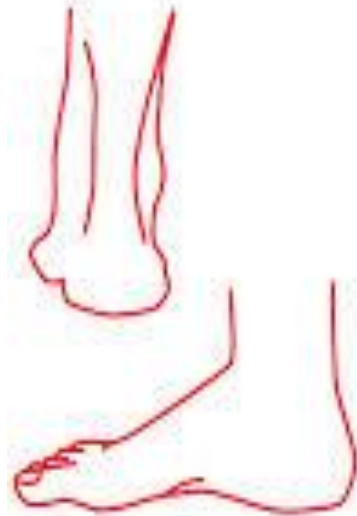
- ▶ Our foot needs to pronate and supinate to fulfill the gait cycle. In another word, to fulfill the walk.
- ▶ Pronation=dorsiflexion+abduction+everseion
- ▶ Supination=plantarflexion+adduction+inversion

# Foot biomechanics

- ▶ However, if pronation and supination are beyond 4-6 degrees they will be considered as unsafe and pathological.
- ▶ Over 80% of the world's population tend to over pronate their feet. A further approximately 10% tend to over supinate their feet. Only 10% of them are normal.
- ▶ Therefore, excessive foot pronation is the major biomechanical issue we need to address.

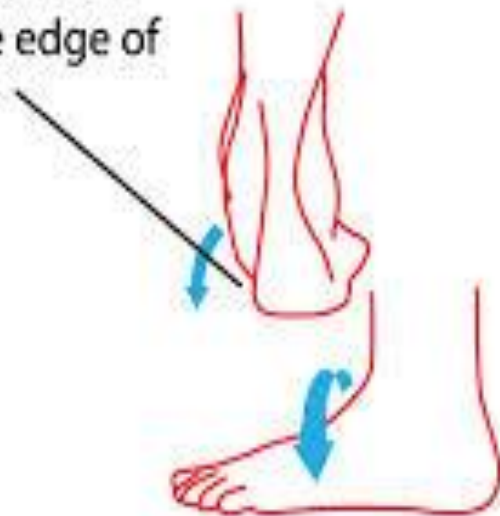
# Foot biomechanics

Normal foot position



Excessive pronation

Weight is on  
inside edge of  
sole

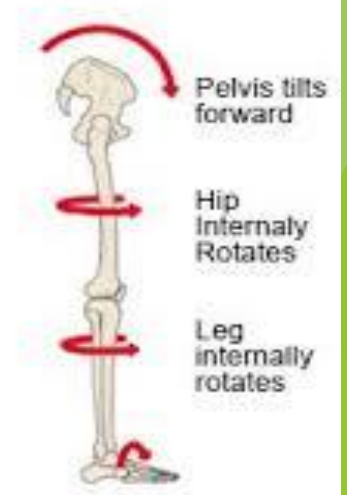
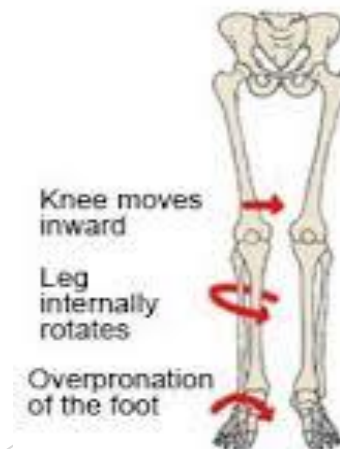


# Foot biomechanics

- ▶ Excessive pronation of the foot is the underlying cause to a range of conditions of the foot, ankle, knee, hip and lower back.

# Foot Biomechanics

- ▶ Through biomechanical chain, excessive foot pronation may lead to faulty mechanics on the ankle, knee, hip and lower back.
- ▶ Excessive unwanted mechanical stress may be applied to the ankle, knee hip and lumbar joints.



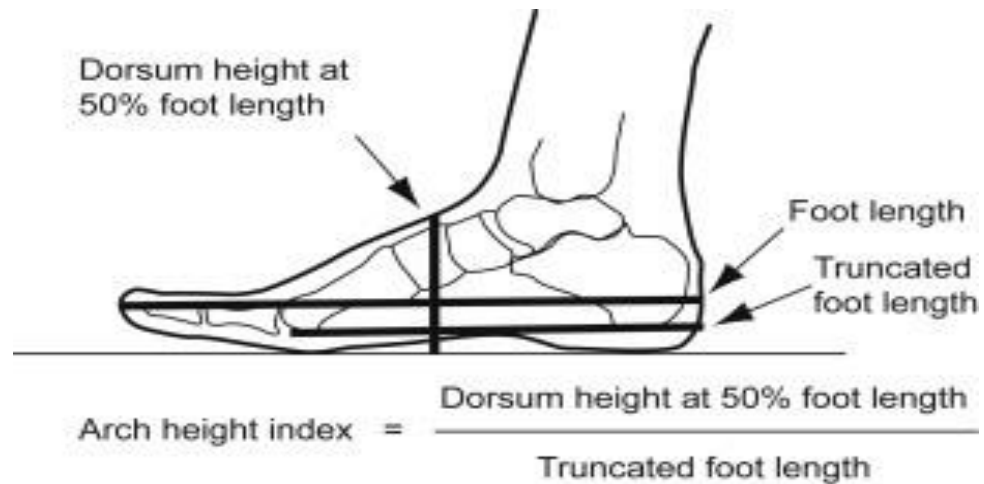


# Causes of the excessive pronation

- ▶ The lower-than-normal foot arch or the flatten/fallen/collapsed arch is the major cause to foot over pronation.
- ▶ When the longitudinal foot arch lowers the foot will roll inwards, namely pronation in medical term. If the arch is higher-than-normal it will push the foot outwards, namely supination in medical term.

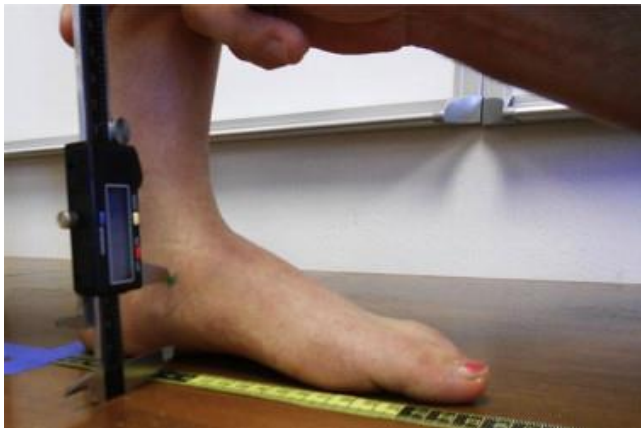
# Assessment of the foot

- *How to find if we are flat footed, normal or high arched?*

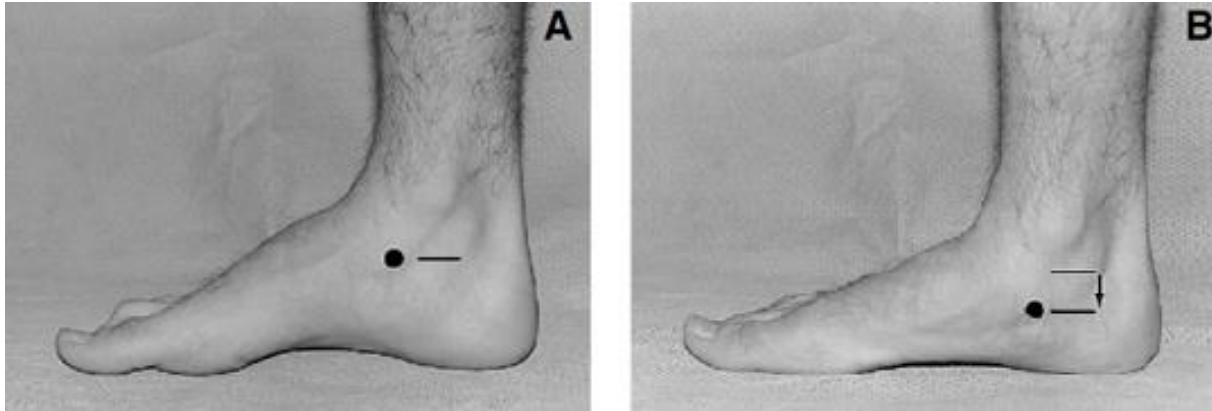


# Assessment of the foot

If assessed by a podiatrist Navicular Drop Test is usually used to precisely check if the foot arch is dropped or not.



# Assessment of the foot-NDT



**Supinated foot**

<5mm

**Neutral foot**

6-8mm

5-9mm

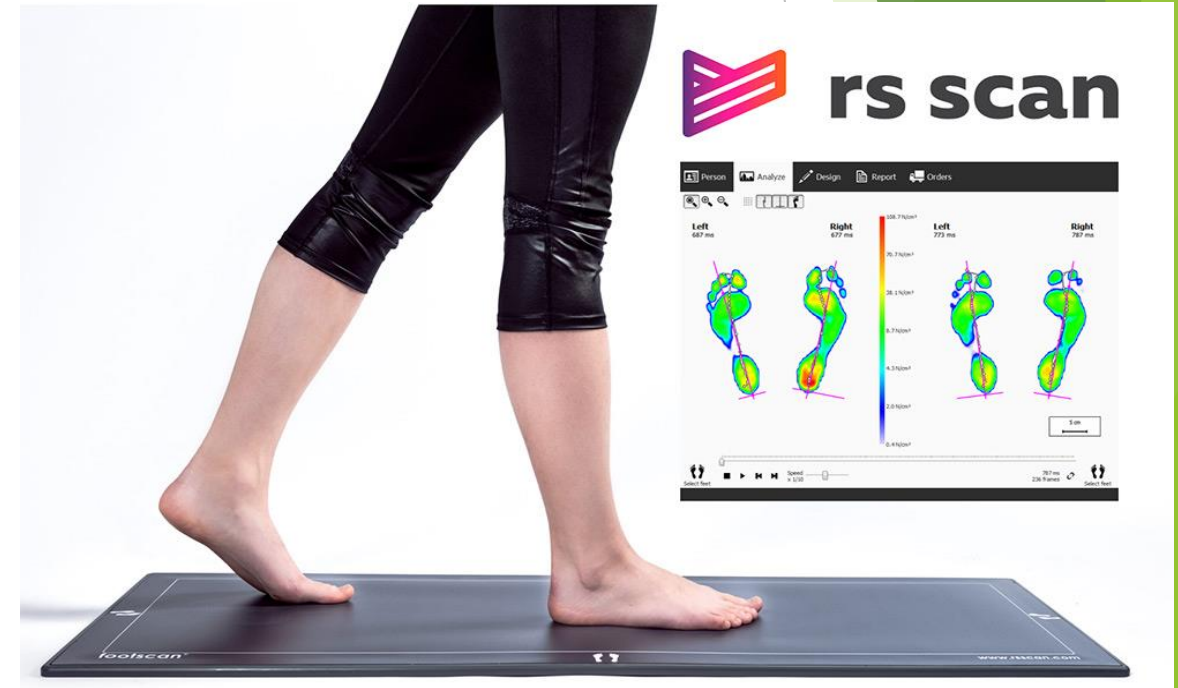
**Pronated foot**

≥10-15mm

>9mm

# Assessment of the foot

The foot can also be assessed by foot scanner as shown in the below images.  
Red dots represent highest pressure on the foot while blue represents the lowest pressure.



# Assessment of the foot

- ▶ However, it is actually pretty easy for us as a layman to check our foot arch. It may not be precise, but it can generally tell.

## 1. Finger test.

- ▶ Stand still and relaxed with feet apart at your shoulders' width. Ask your friend to try to snug his or her index finger into your foot arch. If he or she can easily push his or her finger in it means it may not be a flat foot. If he or she cannot even push it in it means you may have a flat foot.

# Assessment of the foot



# Assessment of the foot

## 2. Check our feet from behind.

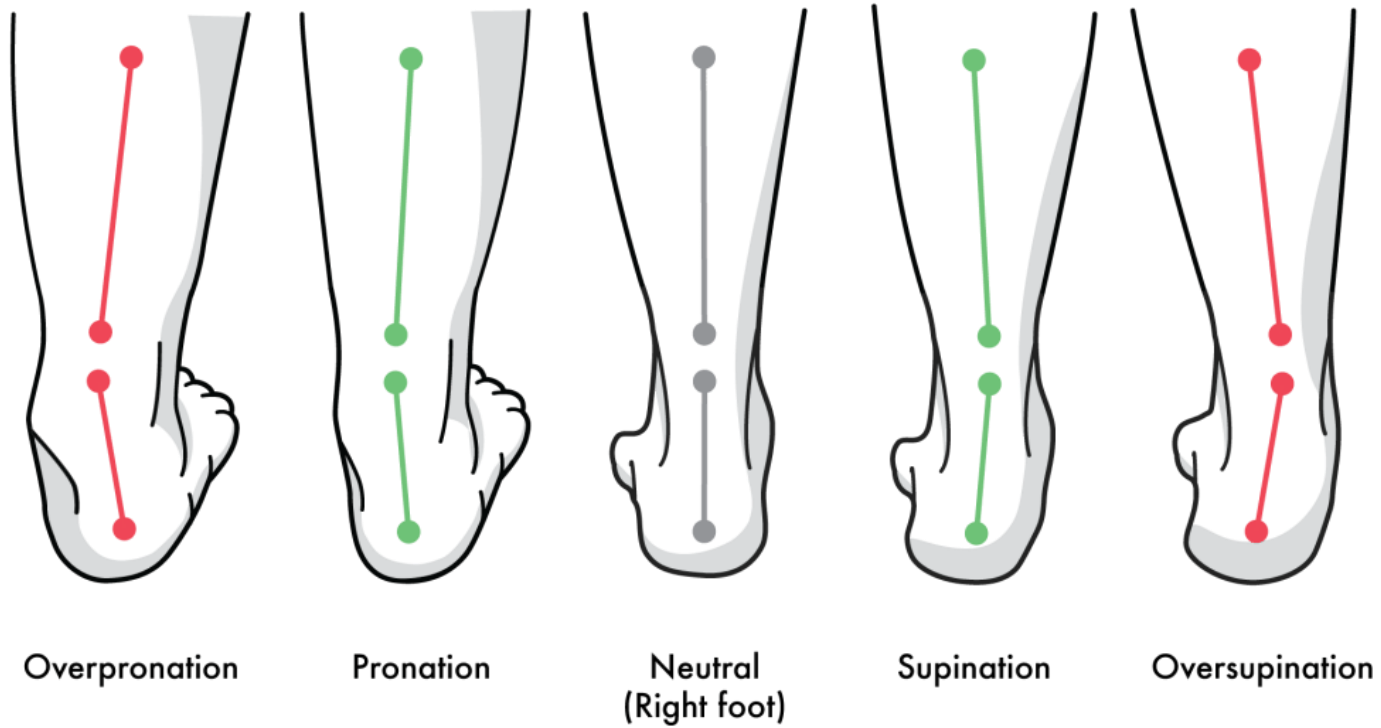
- ▶ Stand still and relaxed with feet apart at your shoulders' width. Ask your friend to check from behind. Look at the midline as reference. If it is straight, it means normal (neutral). If it curves inwards, it means flat foot (pronation). If it curves outwards, it means high arched (supination)



# Assessment of the foot



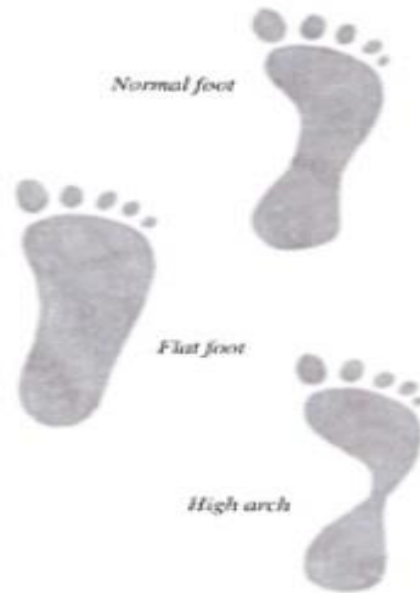
# Assessment of the foot



# Assessment of the foot

## 3. Check footprints.

- Use a piece of white paper. Wet your foot and stand on it and walk away. Check the prints on the paper.



# Risk factors for Excessive Pronation

## ► 1.Excess Body Weight

► Increasing body weight beyond the normal healthy physiological range places unhealthy & pathological stress loads on the medial longitudinal arches of our feet, causing our feet to over pronate.



# Risk factors for Excessive Pronation



## ► 2.Sporting Activities

► Physiologically demanding sporting activities place significantly larger forces on the arches of our feet, causing our feet to over pronate.

# Risk factors for Excessive Pronation

## ► 3. Heeled & Narrow or pointed Shoes

► Heeled shoes tend to push our body mass forwards and inwards towards our medial longitudinal arches, thereby causing our feet to roll inwards in excess of their normal healthy range. This is one reason why women, often who are in the pursuit of fashion, generally report greater levels of foot & lower back pain than men. Narrow shoes, with insufficient insole surface to properly support the foot, exaggerate this problem even further.



# Risk factors for Excessive Pronation

## ► 4.Age

► With advancing age, the soft tissues of our feet tend to lose some of their elasticity & become less supple/less flexible. As a result, the plantar fascia that support the arches of our feet can become pathologically stretched beyond their healthy limits. In turn, this allows our arches to collapse and causes our feet to excessively pronate. This may especially be of serious concern to anybody who has already been diagnosed with other chronic debilitating conditions of their feet, such as osteoarthritis & diabetes.

# Risk factors for Excessive Pronation



## ► 5. Walking on hard surfaces

► Walking on hard unforgiving surfaces, such as concrete foot paths, tiled and wooden floors, cause the arches of our feet to collapse to accommodate the ground reaction forces generated.



# Risk factors for Excessive Pronation



## ► 6. Pregnancy

► Besides overall body weight increasing during pregnancy, the pregnant female body also releases a special hormone called relaxin, to help prepare the body for labour. This hormone, however, also relaxes the plantar fascia, allowing the arches of the feet to lower & the feet to excessively pronate.

# Conditions-Excessive Pronation

- ▶ Excessive pronation of the foot may lead to a range of chronic overuse injuries, conditions, pains and aches.
- ▶ The reason for this is because as a result of over-pronation the body weight shifts inwards of the foot, causing unwanted extra mechanical stress on the soft issues, joints and tendons on the foot and low limb.

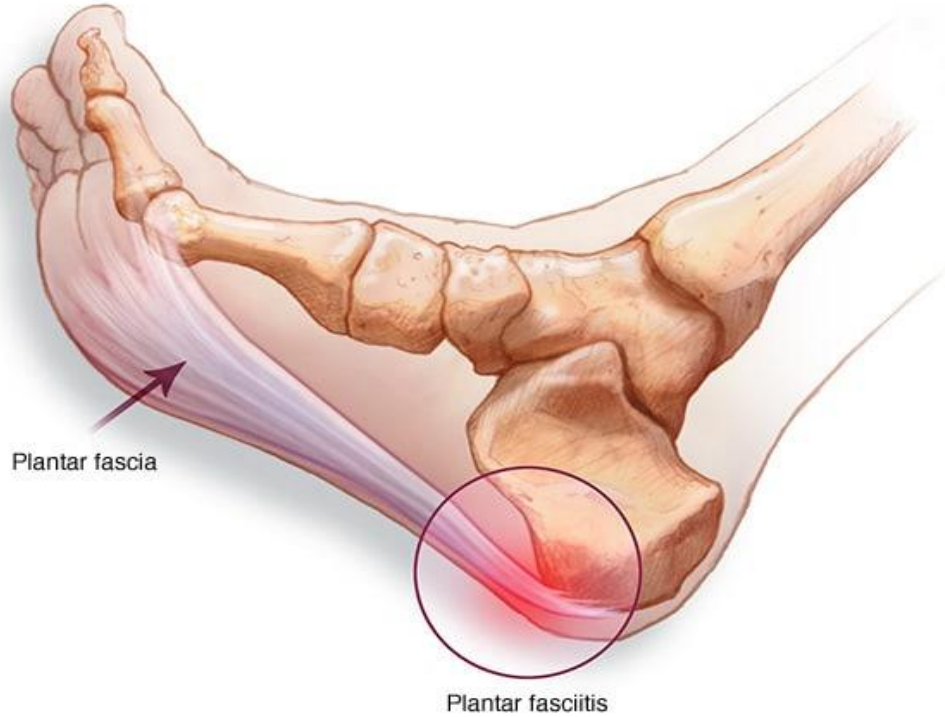
# Conditions-Excessive Pronation

► Below are a range of Foot/ knee/back Conditions that may be caused by foot over-pronation:

1. Heel Spur
2. Plantar Fasciitis
3. Ball of the Foot Pain
4. Achilles Tendonitis
5. Tibia Stress (Shin Splint)
6. Knee Pain/wear
7. Tired Legs
8. Hip Tears/wears
9. Back Pain

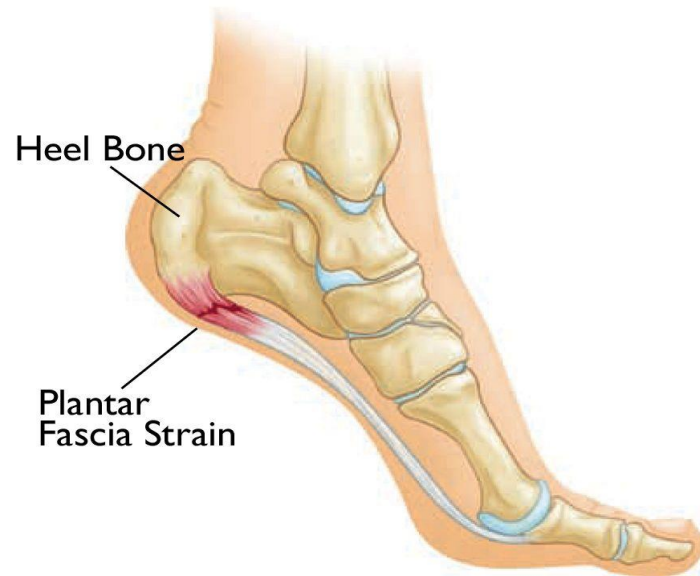
# Conditions-Excessive Pronation

## ► Plantar Fasciitis



# Conditions-Excessive Pronation

## ► Heel Spur

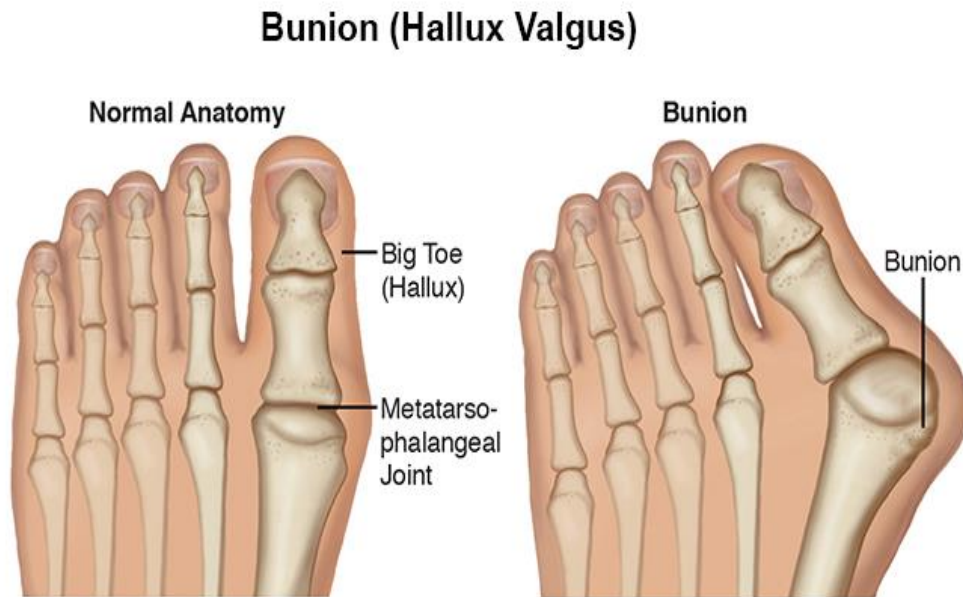


# Conditions-Excessive Pronation Bunion



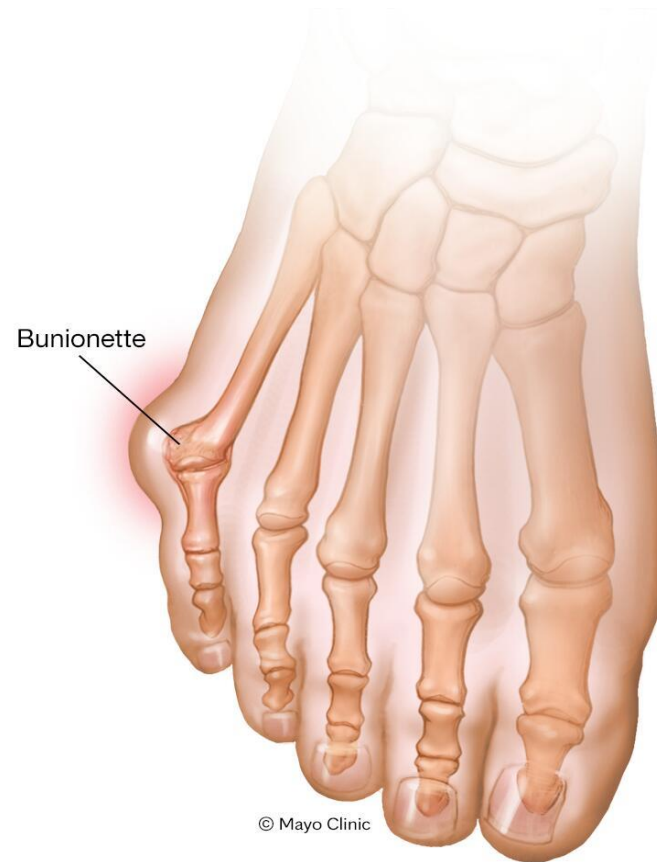
# Conditions-Excessive Pronation

## ► Bunion





# Conditions-Excessive Pronation-Bunion





# Conditions-Excessive Pronation

## Bunions

1. **General Prevalence:** Estimates from various studies suggest that 20-30% of the adult population may have a bunion to some degree, with the prevalence increasing with age. Some sources suggest that up to 50% or more of individuals aged 65 and older have bunions.
2. **Severity:** Not everyone with a bunion will have symptoms or require treatment. The severity can vary, and not all bunions cause pain or functional limitations.

# Conditions-Excessive Pronation

## Bunions

- ▶ Bunion can be diagnosed and analyzed with a simple x-ray, which should be taken with the weight on the foot. The *hallux valgus angle* (HVA) is the angle between the long axes of the proximal phalanx and the first metatarsal bone of the big toe. It is considered abnormal if greater than  $15\text{--}18^\circ$ . The following HV angles can also be used to grade the severity of hallux valgus:
  - Mild:  $15\text{--}20^\circ$
  - Moderate:  $21\text{--}39^\circ$
  - Severe:  $\geq 40^\circ$



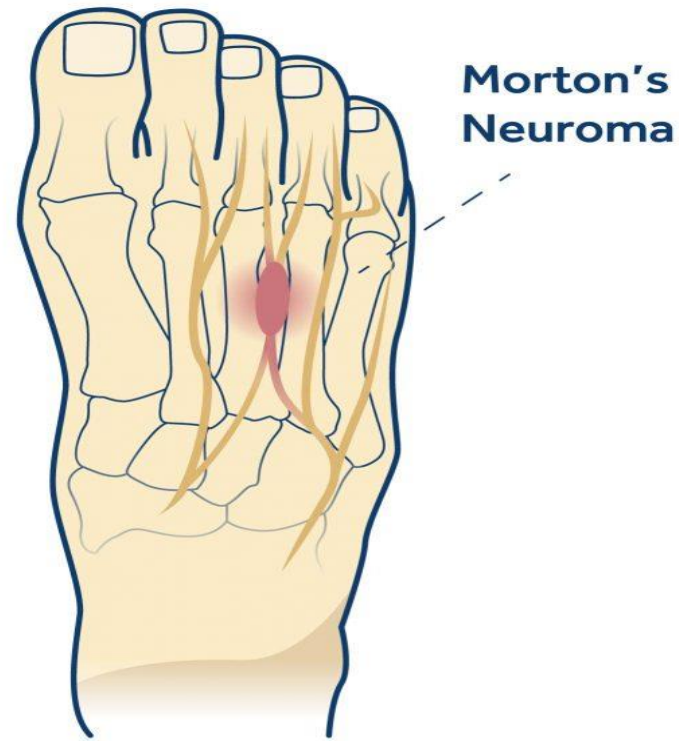
# Conditions-Excessive Pronation

## ► Achilles Tendonitis



# Conditions-Excessive Pronation

## ► Morton's Neuroma



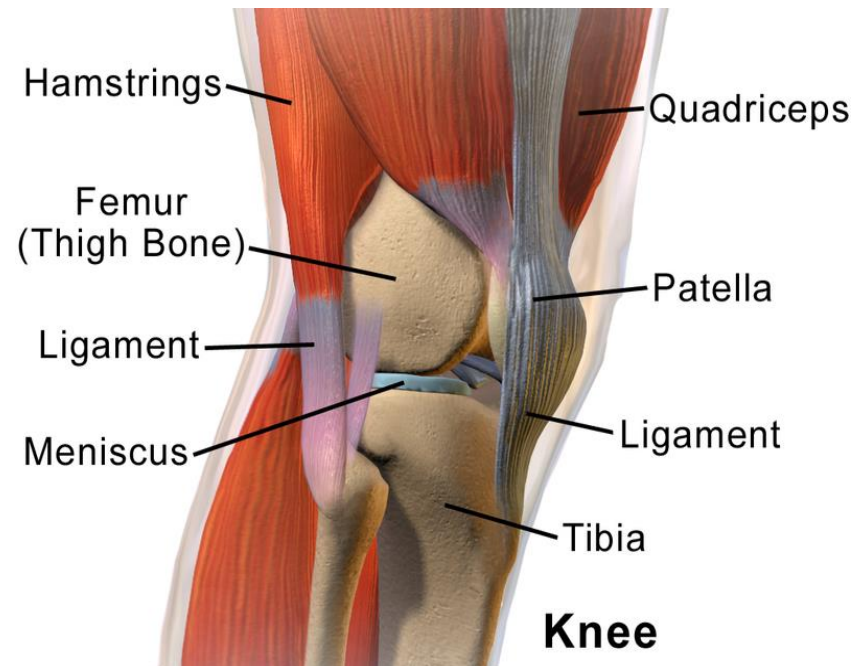
# Conditions-Excessive Pronation

## ► Shin Splint



# Conditions-Excessive Pronation

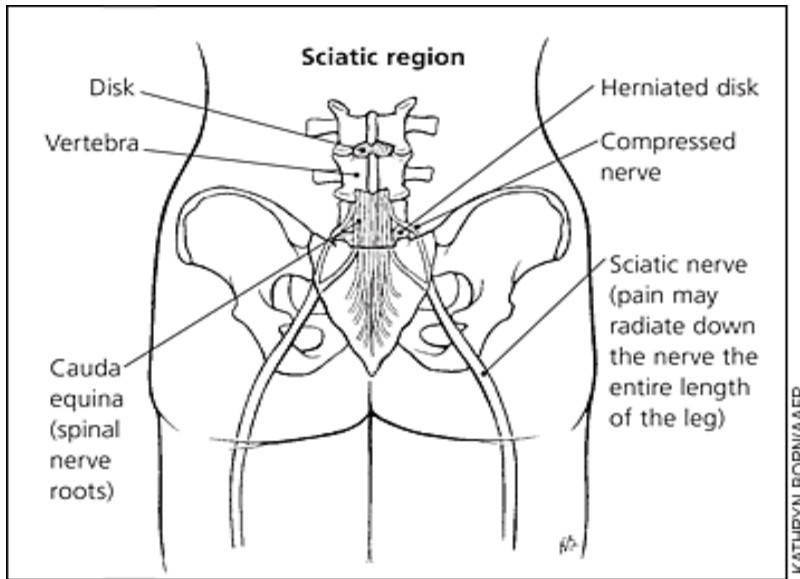
## ► Knee Pain





# Conditions-Excessive Pronation

## Lower Back Pain



# Conditions-Excessive Pronation

- ▶ In addition to the above conditions that may be directly caused by foot over-pronation, there is also a range of debilitating conditions that may be indirectly exacerbated by foot excessive pronation.



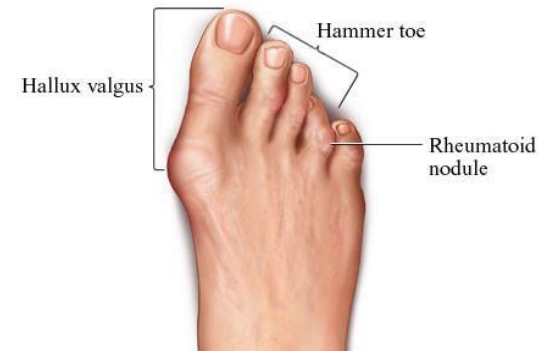
# Conditions-Excessive Pronation

## 1. Diabetic foot neuropathy

- ▶ The most common areas to develop Diabetic Foot Ulcer/s (DFUs) are the metatarsal heads and the heel. Excessive foot pronation will lead to more pressure of the body weight being transmitted to the forefoot and the rear foot. Therefore, chances of developing (DFUs) are significantly higher if you are diabetic and having an excessive pronated foot.



# Conditions-Excessive Pronation



## 2. Rheumatoid arthritis (RA)

- ▶ RA is a chronic condition that may lead to stiffness, swelling and pain on the joints of the foot, ankle and knee as well as the whole body.
- ▶ Excessive pronation of the foot will cause faulty biomechanics of the joints of the foot and the lower limb, placing excessive mechanical stress to these important joints, thus exacerbating the symptoms of RA.

# Conditions-Excessive Pronation



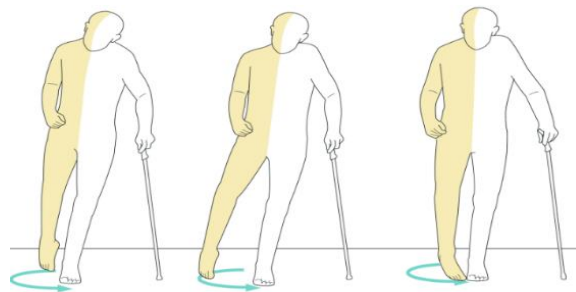
## 3. Gout

- ▶ Gout is a common form of inflammatory arthritis that is very painful. It usually affects one joint at a time (often the big toe joint).
- ▶ Excessive pronation of the foot may place extra stress on the already inflamed interphalangeal joints, thus exacerbating the symptoms.

# Conditions-Excessive Pronation

## 4. Stroke

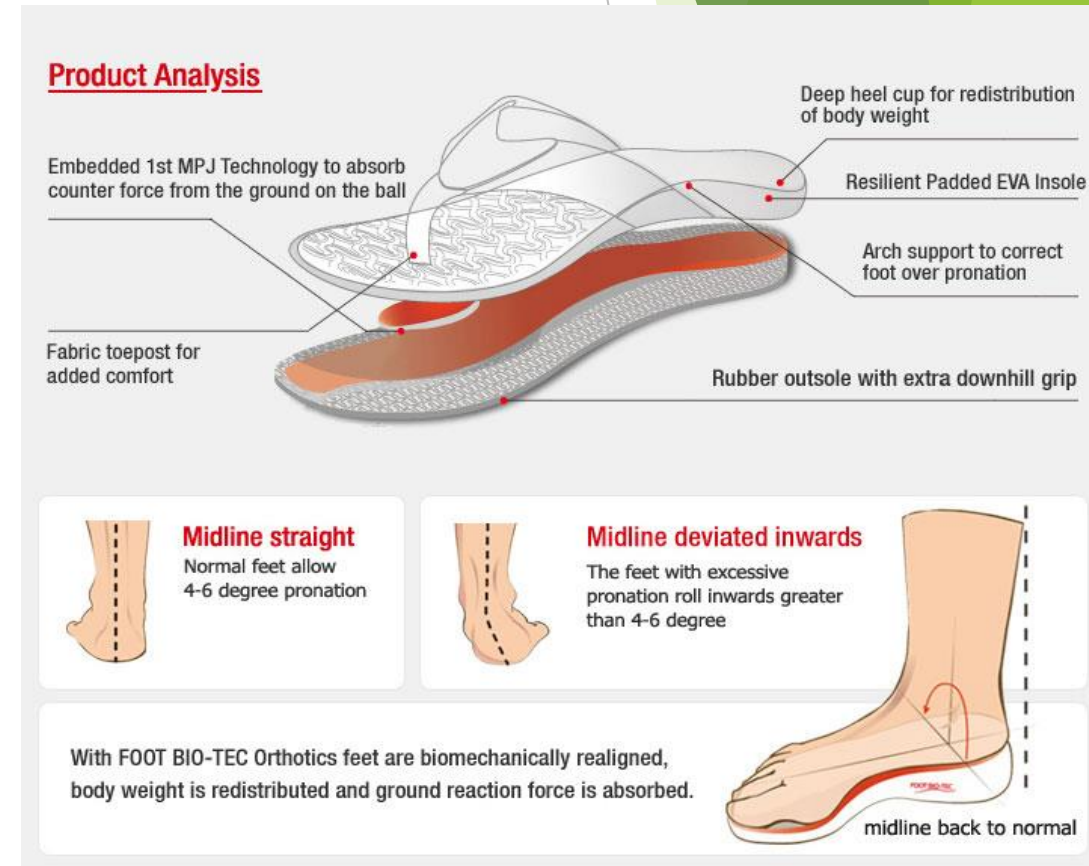
- ▶ Foot drop is one of the symptoms for people after stroke or brain injuries, which makes it difficult for them to walk. Any pre-existing faulty biomechanics on the foot may worsen the problem in walking.



# Orthotic Foot Treatment

Foot Bio-Tec insoles/shoes are designed to address foot over-pronation:

- ▶ Medial/lateral longitudinal arch support
- ▶ Transverse arch support
- ▶ Metatarsophalangeal Joint Protection
- ▶ Rearfoot varus for heel support
- ▶ Top quality shock absorbing material used.



# Orthotic Foot Treatment

An independent clinical trial conducted by an Australian university has proven that Foot Bio-Tec shoes may significantly

1. **Reduce Foot Pain**
  2. **Improve Foot Function**
  3. **Increase the comfort of the footwear**
  4. **May also reduce knee pain, hip pain and lower back pain.**
- 
- Research paper was published by the Journal of Musculoskeletal Disorders. We can supply you the copy of the research paper thru email if under request.
  - We recommend you to see a podiatrist if symptoms persist or if there is a complex deformity on your feet.

# Orthotic Foot Treatment

## ► Custom Made orthotics vs Over-the-counter Orthotics

Research has shown that the professionally designed on-the-shelf orthotic shoes/insoles can equally help in comparison with those custom made orthotics prescribed by podiatrists for the majority of the foot conditions caused by foot excessive pronation.

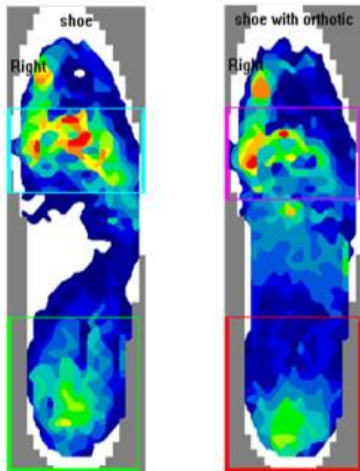
It has saved Australian Medicare hundreds of millions of dollars every year.

- The relevant research paper is available at Google scholar for public access or we can arrange it to be sent to you by email if under request.
- We recommend you to see a podiatrist if symptoms persist or if there is a complex deformity on your feet.

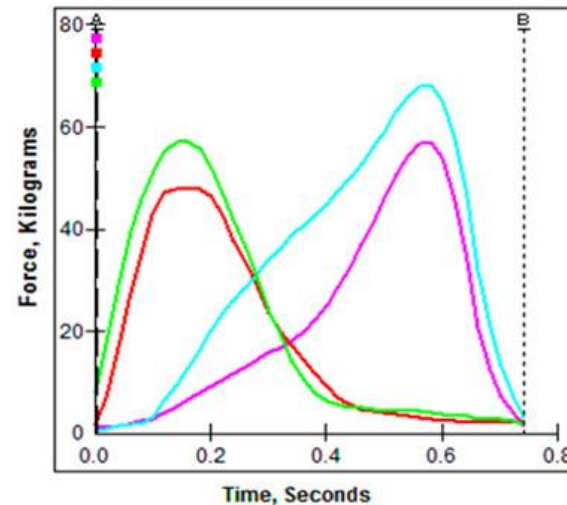
# Orthotic Foot Treatment

Foot scan images show the difference of pressure distribution with Foot Bio-Tec orthotic or without Foot Bio-Tec orthotic on their foot for people with foot over-pronation. Red dots represent highest pressure while blue represents the lowest pressure. With Foot Bio-Tec orthotic the peak pressure dots on the foot are significantly less than those without Foot Bio-Tec orthotic.

Without orthotic    With orthotic



Graph for one step  
Force vs. Time





# High Arched Foot

- ▶ High Arched Foot, also known as pes cavus, is far less common than flat foot, also known as lower-than-normal arched foot.
- ▶ About 10-15 % of the population have high arched feet.
- ▶ While people with lower-than-normal foot arch often tend to over-pronate their foot, people with high arched foot often tend to over-supinate (roll outward) their foot.



# High Arched Foot

- ▶ It is important to note that foot pronation and supination are beneficial to people fulfilling their gait cycle while walking. However, if supination or pronation is beyond 4-6 degrees it may cause damage to your feet.
- ▶ People with high arched foot often excessively supinate their foot, leading to a range of health problems in the following:
  - \* Lack of proper shock absorption, which can lead to increased stress on the foot, ankle, knee, and hip joints, causing foot pain, ankle pain, knee pain (more toward lateral side) and hip pain. High arched foot has minimal pronation and excessive supination. Pronation is vital to allow the body to absorb the body weight on the foot as well as the ground reaction force.

# High Arched Foot

- \* instability in the foot, leading to problems such as ankle sprains, balance issues, and an increased risk of falls.
- \* place more pressure on the ball and heel of the foot, which can lead to calluses, corns, and other painful conditions.

# High Arched Foot

- ▶ **Foot Bi-Tec** shoes/insoles provide sufficient support for high arched foot, allow some degree of pronation to absorb the shock and help redistribute the body weight on the foot. Therefore, Foot Bio-Tec orthotics can help people with high arched foot.
- ▶ Orthotics for people with high arched feet should be in medium to low density to allow their foot to pronation. Some orthotics for people with high arched feet are often so hard that they stop their foot from pronation, thus reducing the ability to absorb the shock. That is why some people may feel worse after wearing some orthotics. Therefore, it is not just arch support that is important, but also the degree of density of the materials that are made for the insoles is vital.

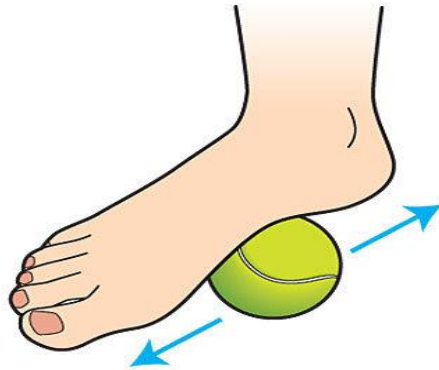
# High Arched Foot

- ▶ **Foot Bio-Tec** are designed with all these factors considered.
- ▶ **Foot Bio-Tec** SWIFT Blue (medium density) and Rivers (dual density) orthotics and Ray Camo/Rise Black/Almond/Sooth Chestnut/Black sandals are recommended for people with high arched feet. Check [www.footbiotec.com](http://www.footbiotec.com) for more details.

# Foot stretching exercises

## 1. Bean Rolling

- ▶ Using a tennis (golf) ball or can that has been chilled in the fridge and roll under your foot from front to back and back again for 30 seconds to 1 minute. Repeat 3 times each foot, 3 times daily.



# Foot stretching exercises

## 2. Calf stretch

- ▶ Muscle tightness in the feet and calves can make plantar fasciitis worse. Loosening the calf muscles can relieve the pain. People can try performing a calf stretch, which involves the following steps:
- Lean the hands against a wall.
- Straighten the knee of the affected leg and bend the other knee in front.
- Keep both feet flat on the ground.
- Hold the stretch for 10 seconds.



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# Foot stretching exercises

## 3. Toe Curls

- ▶ In a seated position, put a towel flat under your foot. Your goal will be to scrunch the towel up using only your toes. Once you have bunched the towel up, curl your toes the other way to straighten it back out.
- ▶ Perform this exercise 10 times. You can repeat it one to two times per day.





# Foot stretching exercises

## 4. Towel Stretch

- ▶ Grab a towel and put it around your foot. While sitting, extend your leg in front of you. Gently pull the towel toward you while keeping your leg stable. You should feel your calf muscle stretching.
- ▶ Hold this position for about 45 seconds, take a break and repeat it two more times. You can repeat this exercise four to six times a day.



# Foot stretching exercises

## Marble pickups

1. Put marbles on the floor next to a cup.
2. Using your toes, try to lift the marbles up from the floor and put them in the cup.



# Foot stretching exercises

## 5. Sand walking

- ▶ Walking barefoot on the beach is one the best and easiest ways to stretch and strengthen the feet and calf muscles and ligaments. This is a good exercise in general because sand's soft texture makes walking more physically demanding.



# Foot stretching exercises

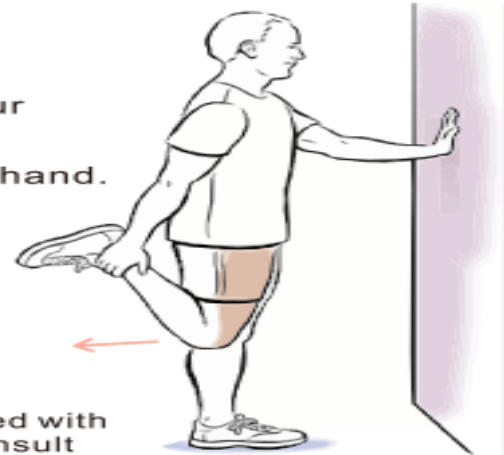


## 5. Seated Hamstring Stretch

- Sit with one leg extended and your back straight. Bend your other leg so that the sole of your foot rests against your mid-thigh.
- Reach toward your ankle. Keep your knee, neck, and back straight.
- Feel the stretch in the back of your thigh.
- Hold for 30 to 60 seconds. Repeat 2 times.
- Repeat 2 to 3 times per day.

## 6. Quadriceps Stretching

- Stand up straight tall on your left leg. Hold your left hand against a wall.
- Lift your right foot and grasp it with your right hand.
- Pull the right foot toward your butt until you feel the stretch in your quads.
- Hold the stretch for 30 seconds and repeat with the left leg.
- Repeat 2 to 3 times per day.



**Caution:** All the above exercises must be carried with care and over-stretching must be avoided. Consult your healthcare professional if you have any doubts.

# Shoe Selections

## **1. For people with diabetes**

You should choose your shoes with the following elements considered:

- a. Avoid narrow and high heeled shoes.
- b. Avoid pointed shoes. Allow the toe box of the shoes to have enough room for your toe to move around.
- c. Avoid wearing flip-flops.
- d. Wearing socks with no stitchings.
- e. Check your shoes for tiny gravels.
- f. Regularly visit your podiatrist for foot checks.

# Shoe Selections

## **2. Do Not have to buy closed orthopedic shoes.**

Just buy orthotic insoles to put them into your existing shoes.

The reason for this is because the difference between a pair of normal shoes and a pair of closed orthotic shoes is the innersole part.

It saves you a lot of money to just buy insoles.

# Shoe Selections

## **3. Soft-soled and hard-soled shoes.**

Soft shoes are so popular in the market nowadays because they feel comfortable when you first step in. However, they may not be healthy shoes for the following reasons:

- a. Although soft shoes help absorb the body weight, some shoes are too soft to be able to bounce back. It means your foot and lower leg muscles have to work harder to pull your foot off the ground. You may end up feeling sore and tired after a walk with the soft shoes on.
- b. Soft shoes provide insufficient support on your arch and inadequate stability. You will feel more wobbly when walking, especially on rough terrain. Soft-soled shoes may potentially increase the risk of falls due to their lack of support and potential for reduced traction, depending on the circumstances. The risk could vary based on various factors such as the individual's balance, the environment in which they're walking, and the specific design of the shoes.
- c. Shoes should not be too hard-soled either, particularly on the forefoot part. The soles of the shoes should be soft enough to allow the foot to dorsiflex (bend) to fulfil the walk.