

Rehabilitation with Pilates

Flat Feet – *Pes Planus*

Naiké Durel

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Table of contents

Title	p.1
Table of contents	p.2
Abstract	p.3
Anatomy of the foot	p.4-5-6-7
Case of study	p. 8-9
BASI program setting	p.10 -11
Conclusion	p.12-13-14-15
Index	p.16-17

Abstract

The feet, even if it's a small part of body, plays a major role in it. Yet most of us do not give the attention and care they would need and deserve. We wear the wrong shoes, we over use them (runners, high physical activity people, etc.) without focusing on the right alignment, and the propel.

We also tend to forget how much weight and pressure they have to take throughout an entire life every single day. When you start a gym program or any type of activity, how many times will it address the feet, to strengthen or stretch them? Unfortunately, not that much! Some people will even think it's a joke or it's unnecessary to do so.

Luckily, once we do take some time for our feet we realize how good it feels and how very quickly we can feel the benefits of it.

Anatomy of the Foot

The very complex structure of the foot is “divided” in three parts:

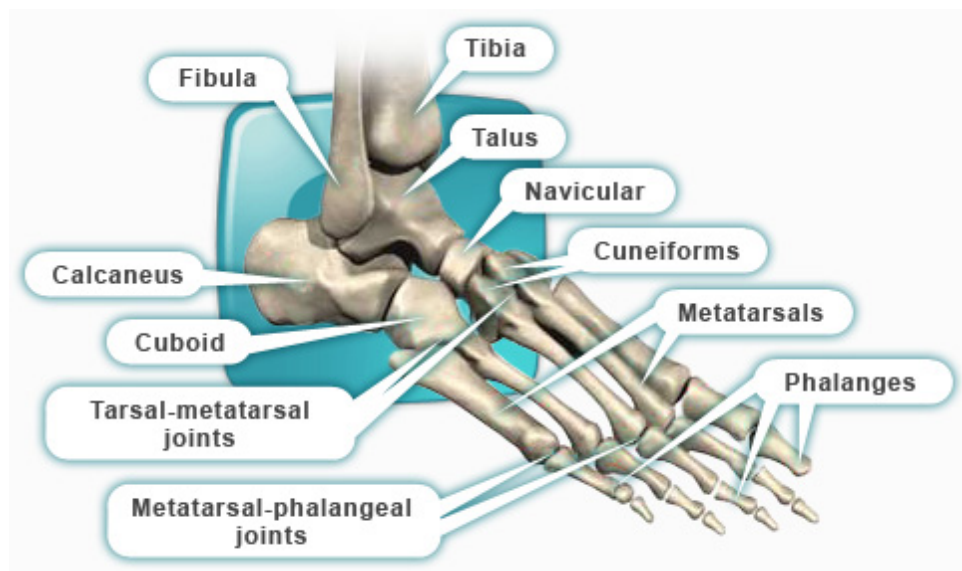
-**The forefoot**, with the five metatarsals bone and the phalanges.

The first metatarsal (under the hallux) is the thickest and shortest one, having several tendons attached to it. It also plays a great role in propulsion. The other 4 metatarsals bones are the most stable ones with minor tendons attachment but do not have strong pulling forces. Also is two sesamoid bones.

- **The midfoot** with it's five bones: cuboid, navicular and three cuneiform and multiple joints.

-**The hindfoot** with two bones: the calcaneus (heel bone) is the largest one, and on top of it, the talus acting as the pivot by supporting the tibia and fibula.

The Bones of the foot

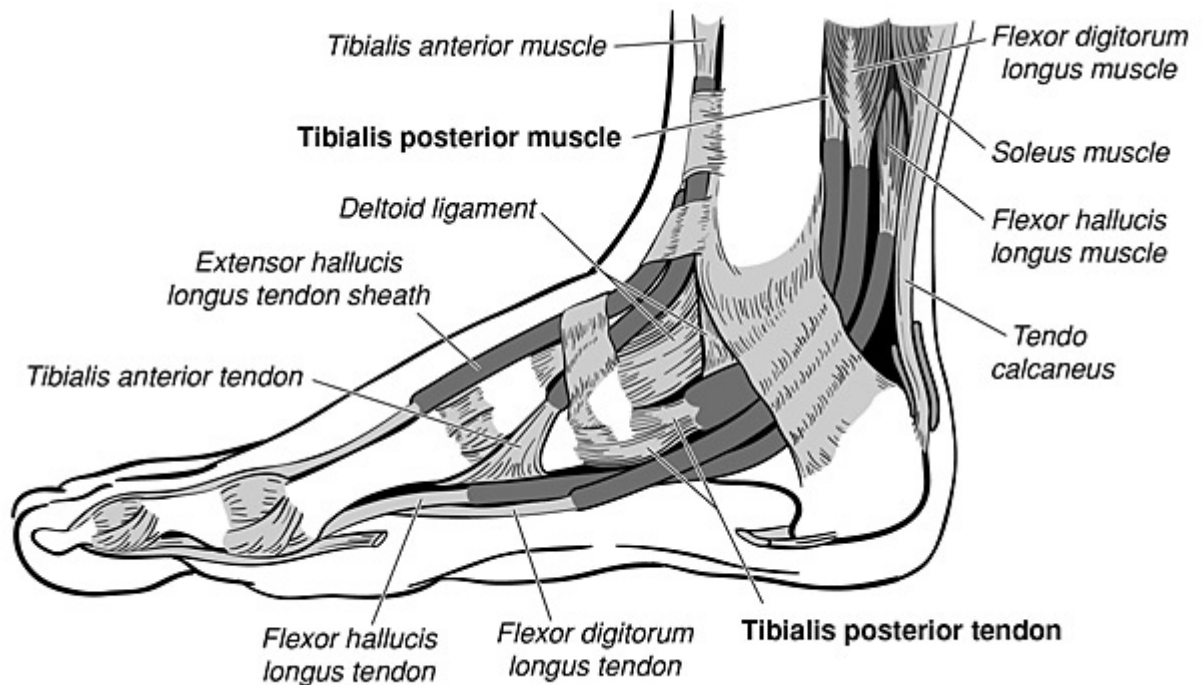


Anatomy of the Foot

We can differentiate two types of muscles:

- **Intrinsic muscle**, within the foot, playing a role of supporting the arch and moving the toes. They are plantarflexors, dorsiflexors, abductors and adductors of the toes.
- **Extrinsic muscle**, found in the lower leg, yet attached to the bones of the foot and helping in movement. They all have multiple articulations, working on the foot, ankle and sometimes the knees.

The muscles of the foot

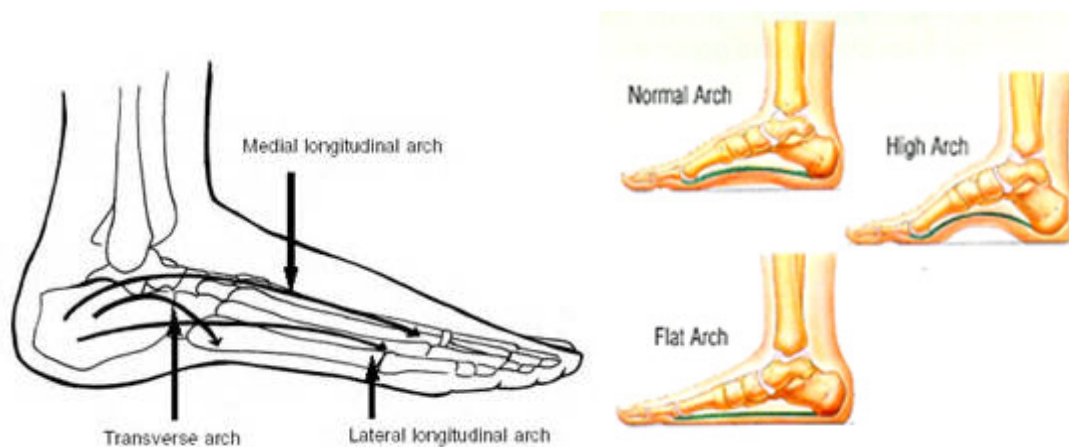


Anatomy of the Foot

The foot has three arches:

- **The medial longitudinal arch**, composed of the first three metatarsals, cuneiforms, navicular, talus and calcaneus. This arch is the highest and most important one.
- **The lateral longitudinal arch**, lower and flatter than the first one, composed of the last two metatarsals, the calcaneus and the cuboid.
- **The transverse arch** goes along the cuboid, the cuneiforms and the five metatarsals bases.

The arch can be either too high (*pes cavus*) or flat (*pes planus*).



Anatomy of the foot

All and all, it is made of 26 bones and 33 joints working with more than 100 tendons and ligaments and 20 muscles. They work together as support for the body weight and helps it to propel. It has to be strong enough to be able to take more than 100 000 pounds of pressure, as well as, stable and flexible to take all the uneven surfaces. The foot can accomplish six movements: dorsiflexion, plantarflexion, inversion, eversion, abduction and adduction. If you combine some of these motions, you will have supination (plantarflexion, adduction and inversion) or pronation (eversion, dorsiflexion and abduction).

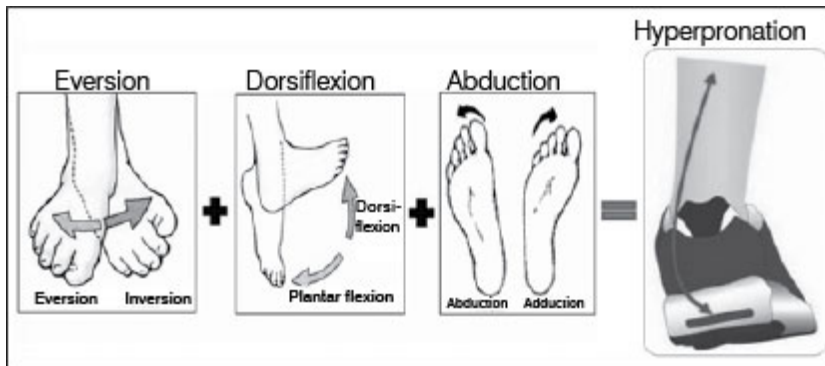


Figure 1. Excessive pronation of subtalar joint.

In my client case, we have flat and pronated feet. This can occur when the medial longitudinal arch flattens. As a result, the foot rolls in to maintain its stability.

Pronation starts at the subtalar joint in the ankle. This condition can happen at any stage of life, being congenital or after a pregnancy, a weight gain, little physical activity or on the contrary, walking/ running too much on hard surfaces.

Case study

My client is a 35 years old male, 6'8 feet tall, basketball player who has some Pilates practice. He has flat feet. His several years of basketball practice either created or worsen his feet's condition. Running back and forth on the hard basketball court surface might have caused micro trauma. As a result, the posterior tibial tendon, (that holds the arch) starts to weaken.

Feet are the body's foundation. An imbalance or an issue with them will affect the rest of your body. So for me is a necessity to focus on the Kinetic Chain by either strengthening or stretching his feet, knees, hips, back, abdominals, gluts and his posterior and anterior trunk. I will also work on his alignment, balance and proprioception so he has better postural and body awareness and can be less likely to make a false move. Even if he has been wearing insole for a few years, it might help a little to relieve some stress on his feet but it does not resolve the problem.

Here is what you can see looking at my client.

- Pronated and flat feet
- Legs turned in
- Lumbar lordosis
- Slight kyphosis

Below is a table with his condition and therefore what should be strengthened and /or stretched.

Condition / Exercise	Strengthen	Stretch
Pronated feet	*Tibialis posterior /anterior *Intrinsic and Extrinsic Foot muscle	*Triceps sura (gastrocnemius, soleus)
Internal rotation of tibial	*Tibialis posterior *Hamstring	*Triceps sura
Hip adduction	*Glutes minimus, maximus, medius *Tensor Fascia Lata	*Hip adductors (adductors brevis, longus, minimus, magnus, pectineus, gracilis, obturator Externus)
Internal rotation of hip	*Hip external rotators (Piriformis, Gemellus superior/inferior, Obturator internus, externus, Quadratus femoris)	*Hamstring * Hip adductors
Anterior tilt of pelvis	*Abdominals *Hamstrings *Gluteals	*Hip Flexors (ilio-psoas, rectus femoris, sartorius, TFL, gracilis, pectineus, adductors longus and brevis) *Lumbar spine *Latissimus dorsi *Iliopsoas *Serratus posterior
Thoracic kyphosis	*Erector spinae (Iliocostalis, longissimus, spinalis) *Rhomboid *Trapezius	*Pectorals *Serratus anterior *Latissimus dorsi *Abdominals

Basi Block System Program

Block system	Session model 1	Session model 2
Pre / Warm up	<i>Mat work</i> Roll down Pelvic Curl Spine twist supine Chest lift Chest lift/ rotation	<i>Mat work</i> Roll down Pelvic Curl Spine twist supine Chest lift Chest lift/ rotation
Foot work	<i>Cadillac</i> Parallel heel / Toes Open V heel / Toes Calf raises Prances Hip opener	<i>Reformer</i> Parallel heel / Toes Open V heel / Toes Calf raises Prances Single leg heel / Toes
Abdominal work	<i>Cadillac</i> Mini Roll up Mini Roll up oblique Roll up Top Loaded	<i>Wunda chair</i> Standing Pike Standing Pike Reverse Cat stretch
Hip work	<i>Cadillac</i> Bicycle Hip circle	<i>Reformer</i> Up circles Down circles Opening
Spinal articulation (after 10 sessions)	<i>Cadillac</i> Monkey Tower	<i>Reformer</i> Short spine
Stretch	<i>Reformer</i> Standing Lunge	<i>Reformer</i> Kneeling Lunge
Full Body Integration	<i>Reformer</i> Stomach massage round back Stomach massage Flat Back	<i>Reformer</i> Downstretch Elephant Up stretch 1

Basi Block System Program

Block system	Session model 1	Session model 2
Arm work	<i>Reformer</i> Kneeling Salute Kneeling Biceps	<i>Reformer</i> Seated Chest expansion Seated Rhomboids
Full Body Integration 2	<i>Reformer</i> Long stretch	<i>Wunda chair</i> Seated torso press
Leg work	<i>Reformer</i> Single leg skating	<i>Wunda chair</i> Standing leg press
Lateral flexion /Rotation	<i>Reformer</i> Tilt Twist	<i>Wunda chair</i> Side Over
Back extension (ends with a Roll Down)	<i>Reformer</i> Breastroke prep	<i>Wunda chair</i> Basic swan

Conclusion

Beginning and ending the session, I do a few Roll down with him so he can see the before and after difference, “scan” his body and balance.

For the **warm up**, it will help him stretch his lower back, stabilize his pelvic region and work on his abdominals.

In the **foot work**, we are focusing on his alignment, strengthening/stretching his lower body muscles (including feet) and stabilizing his pelvic-lumbar region.

The **abdominal work** I chose for him is specific not only for his abdominals but also to stretch his lumbar region and shoulders, and teach him the neutral pelvis and scapula stabilization. So we help on his anterior pelvic tilt and thoracic kyphosis. The exercises on the Wunda Chair will also challenge his balance and proprioception.

Hip work, will help him stretch/ control his hamstrings and adductors, and stabilize his pelvic-lumbar region.

Conclusion

Spinal articulation, to increase his hamstrings, lumbar and calves flexibility and abdominal control.

Stretch, focusing mainly on his very tight hamstrings , lower back and anterior upper trunk.

Full Body Integration, working on his plantar flexors, abdominal, back extensors, trunk and scapula stabilization. Also he will improve his hamstring and shoulders flexibility and stretch his chest.

Arm work, stretch his chest and shoulders, challenge his balance, trunk stabilization and strengthen his arm and back muscles.

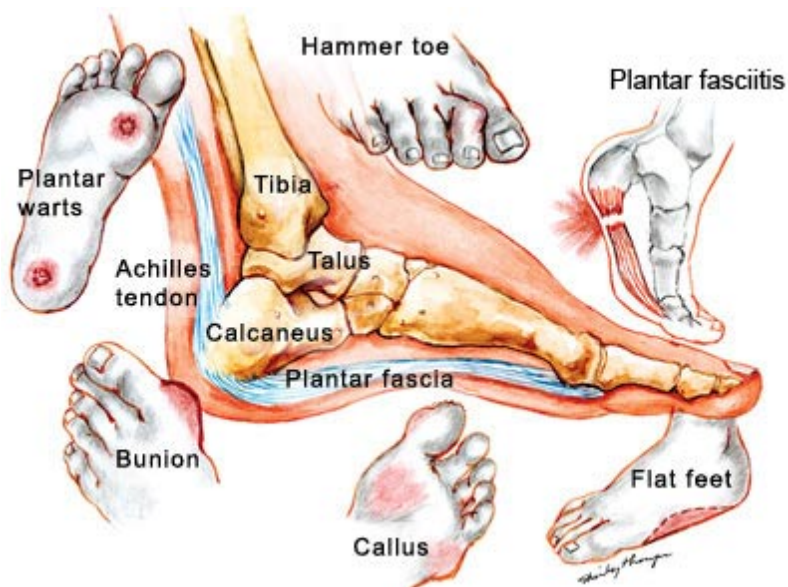
Leg work, helps him with his balance and proprioception. Strengthen his hip abductors and stabilize his pelvic-lumbar region.

Lateral flexion / rotation works on his abdominals oblique by stretching and strengthen them.

Conclusion

Back extension, gives him some abdominal control, stronger back extensors and scapular stabilization.

Some people having flat feet will not suffer from it but many others will. In that case, the pain won't just stop at their feet but will affect their whole body. It is the cause or contributes in pathologies or injuries like arthritis of feet/ ankles, hammertoes, callus, shin splints, Hallux abductor Valgus (bunion), patella-femoral pain, plantar fasciitis, Achilles tendinitis, lumbo-sacral pains, ...



Conclusion

Orthopedic insoles are in many people's mind as the only solution, without having surgery. But yet the problem is not being treated at its roots. By just wearing insoles, you give a break to your feet but not a re-education.

Because it can affect the whole body it is of the utmost importance to work on it with patience and consistency.

By doing Pilates, on Mat or on Apparatus, we can really help by treating someone in its whole and ideally bring back proper alignment and musculature balance.

As for my client, we both have seen already a change in his feet position, his arch and he suffers a lot less throughout the day. He also has a better posture and body awareness. He also improved his focus when he plays basketball as how to run and jump.

Index

Website

- Foot anatomy

http://www.medicinenet.com/image-collection/foot_anatomy_detail_picture/picture.htm

- foot Biomechanics

<http://www.northcoastfootcare.com/pages/Biomechanics.html>

- Feet advice

www.flatfeetadvice.com

Books

- Anatomy of Movement

Blandine Calais Germain

- Pilates Books BASI

- Pilates for Injuries and Pathologies BASI Pilates

- “ Les exercices qui vous soignent, Trouble de la posture et ergonomie” Tome

2 , Les editions de l’homme.

- Le grand guide visuel du corps humain, Edition ERPI

Pictures

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