Academy of PHYSICAL MEDICINE

Broadcast Summary

Caution: These notes should be used in conjunction with the recorded interview. While every effort is made to ensure accuracy, APM cannot guarantee freedom from any errors. Treatment should be based on the advice given by the expert speaker during the interview. Please let us know if you find any errors in this text, so that we can correct them.

Bare Truth

With Matt Walden

About Matt Walden

- Trained as an Osteopath and Naturopath
- BSc(Hons) and MSc in Osteopathic Medicine
- Trained in the CHEK System between 2001-2005
- Worked in professional sports by 2003
- Bought an early version of the Vibram Fivefingers in 2006 and was the person who explained to Vibram that their "sailing shoe" had applications in rehabilitation and conditioning.
- Associate Editor of Journal of Bodywork and Movement Therapies
- Presented internationally to various medical groups.
- Author of chapter on Rehabilitation in "Naturopathic Physical Medicine" (Chaitow L, Churchill Livingstone; 1st Edn 2008)
- www.mattwalden.com

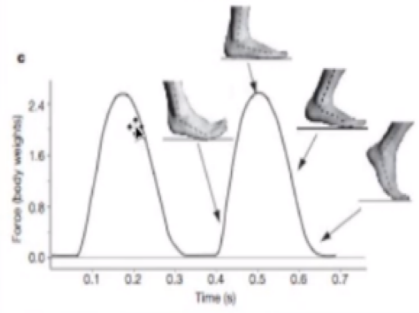
Gait

- Involves steps and strides. Phases of gait for both walking and running include – heel strike, mid-stance, heel-off, toe-off, and swing.

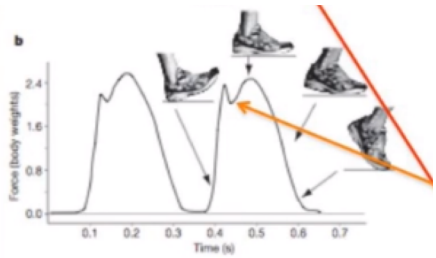
- Walking barefoot makes an individual switch from heel strike to forefoot strike at the early stance phase.

Running gait and barefoot running

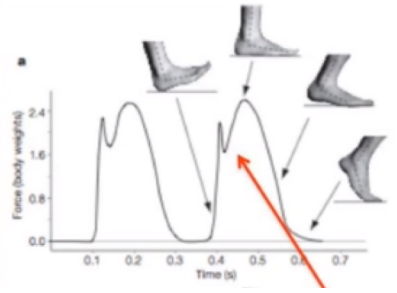
- In running, heel striking creates an impact transient which can be injurious. This is common among those who run in running shoes.
- Individuals who switched to minimalist shoes or completely barefoot sometimes continue to heel strike when running which is risky.
- It is recommended to take as much as 6 months to make the transition.
- To improve running speed, taking longer stride is discouraged because this makes the runner heel strike more firmly and send more shock to the lower limb.
- Minimalist runners have much greater muscle development in their feet particularly the abductor hallucis brevis.
- The muscular system takes a while to adapt from heel striking to forefoot striking. The latter puts more load to the calves and Achilles tendon. The common problem that people report when they switched to minimalist shoes or barefoot running is sore calves.
- The glute max can only be activated when individuals run at speeds, do heavy lifting and deep/loaded heavy squats when climbing or jumping.
- The tensor fasciae latae connects to glute max via the ITB and helps prevents over pronation under load.
- When barefoot running in forest environment avoid stepping on sticks and roots – watch out for snakes(!). Reduce vibrations going through the head to then focus on the surroundings.



- Skilled barefoot runner (without impact transient)



- Shod runner has 2x load of skilled barefoot runner



- Unskilled barefoot runner has 7x load of skilled barefoot runner
- Cadence is key to getting the technique right when switching from shod to barefoot. The higher the cadence, the easier is to forefoot strike and the lower the impact.

- Downloadable metronomes can help individuals improve their running form by finding the best cadence (the latter helps address the ball of the foot pain).

- Running barefoot is more akin to a sport where one needs to focus every second of the game in order not to lose. One has to be completely engaged and be watchful not to drift off. Stepping on roots or stones can bruise/hurt the sole of the foot.

- Phil Beach's analogy for barefoot running: "Running with shoes on is like fast food (i.e. taking calories in) while running barefoot is like fresh organic salad (i.e. real sustenance)."

- People had been running on forefoot strike for 4,000,000 years, meaning that they had been loading their Achilles eccentrically with every strike. It has only been in the last 40 years that people started to heel strike when running which does not eccentrically load the Achilles.

- People will not find it very easy to heel strike under their centre of mass. Dorsiflexion that occurs is what buys them the time of the forefoot strike because they start with plantar flex position and as they load down, their bodies move over the top which minimises the impact – this is called angular momentum.

Running shoes evolution

About 4,000,000 years ago	• People were barefoot or minimalist
About 40,000 years ago	• People started to wear shoes made of moccasin leather – no sole • People migrated into places with colder climates i.e. either the invention of the shoe allowed them to move to places with colder climate or moving into them necessitated the invention of shoes.
1800's	• Initial attempts at running shoes were made from leather • Plimsolls were manufactured which were later on added with feature like running spikes at the bottom
1970's	• Nike came up with lightweight shoe designed for running • Cushion heel wedge / waffle sole

- The original concept of the MBT shoes (with rocker soles) is to mimic the way the muscles walk on soft sand – recreating a rolling sensation of the foot from the heel to toe to minimise impact. But these shoes were actually marketed in a way that they provide instability and therefore make the muscles work – toning the leg muscles and burning cellulites.

Barefoot or shod

- People who grew up wearing shoes have hypersensitive feet in the same way that those who were used to wearing sunglasses or eye masks get blinded or overstimulated when suddenly exposed to light.

- It takes a while to transition from being shod to being barefoot (minimum of six months).

- In the context of the equine world, the hoof is designed to attenuate the shock effectively and putting something rigid onto it reduces this particular capacity. Just as the shod hoof does not splay and therefore does not attenuate the jarring, so does the shod human foot. The toes tend not to splay. This is an issue with shoe design.

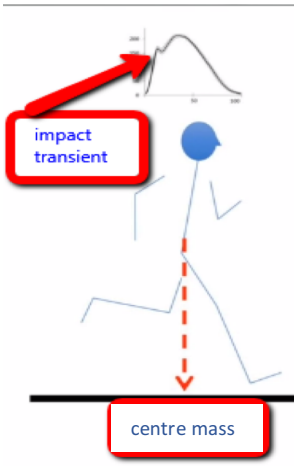
- A standard shoe allows a full range of motion of only 1 or 2 joints in the foot – all the other joints are restricted due to the rigid sole of the shoe (i.e. no information is going through the nervous system). Going barefoot allows the mobilisation of all 33 joints in the foot the way nature intended.

- Individuals who do not wear shoes have much more hypertrophy feet.

- In-toeing gait is not unusual in young children because their hips are still developing. They normally grow out of it by the age of seven. Wearing minimalist shoes can help improve their gait specifically if their in-toeing is more of a motor control issue – observe between 8 to 12 weeks; if the condition does not improve try another approach.

- If in-toeing persists by the age of 10, it is worth looking for genetic factors like femoral anteversion, tibial torsion, etc. Minimalist shoes cannot help if the in-toeing gait is due to structural issue.

- The image below shows that when people heel strike they typically overstride. Their foot goes out in front of them ahead of their centre mass. This is what causes the ground reaction force.



- When they increase the cadence, they place their foot down again just ahead of their centre of mass, but on the forefoot. By the time the heel moves down to the ground, their centre of mass has moved ahead of their ground contact – causing no impact transient.

Arches, pronation, supination, and orthotics

- There are three types of foot arches: two longitudinal (medial and lateral) arches and one anterior transverse arch.

- A flat foot is the result of the muscles and nervous system not being awake. A foot that is healthy and functional has an arch and when it becomes deconditioned or inhibited the arch either disappears under load or simply disappears.

- People nowadays have been conditioned by external support for the arches and often it is the primary consideration when buying shoes for their children. But it is recommended for them and their children to spend time barefoot as much as they can comfortably.

- Pronation is not a foot issue. Over pronation is typically a descending issue coming from the hip and from the core. In order to resist the over pronation forces when running, the intrinsic muscles in the foot have to work in conjunction with the muscles in the shin, hip, core, and the myofascial connections between them.

- Gravity is what collapses individuals into pronation, medial rotation and flexion while the anti-pronation muscles, supination muscles, and extension muscles are what lift individuals up against gravity.

- Protracted shoulders, pronated limbs and feet are signs that individuals are not able to effectively resist gravity thus the need to condition those muscles.

- When individuals go into barefoot, they tend to roll into pronation and get a stretch in the passive subsystem (i.e. plantar fascia on the medial side, medial longitudinal arch). The mechanoreceptors then fire up and inform the nervous system to activate the anti-pronation muscles. This should happen in a barefoot situation.

- When muscles like the gluteus maximus are inhibited or deconditioned, what tends to happen is the piriformis tries to compensate. Individuals with deconditioned glutes stand with outturned feet - extremely rotated, feet pronated (the latter is a contradictory pattern because external rotation should have naturally go with over supination not over pronation). Close observation of how individuals move in activities of daily living informs how they transfer loads through their body.

- The glutes are the most powerful muscles in the body. They are key to preventing over pronation in the foot.

Retraining the Arches

Demonstrates how to reform arches in flat-footed individuals with the aid of a foam roller.

1) Use the credit card to check whether or not the lateral malleolus is in direct vertical alignment with the lateral border of the foot. (Hind foot supination is when the lateral malleolus is overhanging the lateral border of the foot).

2) In patients with imperfect vertical alignment (between their lateral malleolus and their lateral border of the foot), roughly estimate in millimetres the space between the lateral malleolus and the credit card. Eighty percent of the people assessed are over pronated – the lateral malleolus is within the lateral border of the foot.

3) Lay the patients down lengthwise on the foam roller (one knee bent up, one leg raised). This position stimulates their tonic nervous system – their arch muscles switched on particularly among over pronated individuals. This can result to the alignment of the subtalar joint. (Raise one leg for 30 seconds, rest down for 5 seconds- repeat for 5 minutes)

4) Gradually build, strengthen, and rehabilitate the arch step by step starting with the position suggested above, into sitting then to single leg standing, and then to walking gait and running gait, etc. Can be combined with barefoot or minimalist walking.

- Over pronation under load is what creates hallux valgus – the stress is through the first MTP. Pronation of the foot (when seen from the ground up) causes medial rotation of the knee all the way up the hip.

- Over supination is when the intrinsic musculature is generally weak or inhibited thus the tendency to recruit the extrinsic musculature (i.e. tibialis posterior, tibialis anterior). Over supinators are more prone to shin splint type pain and stress fractures.

- The issue with foot in general is that it is treated like a machine without a feedback mechanism. The nervous system is overlooked in many cases. With orthotics for example, the body is often seen as a passive entity that will respond to a passive input without considering how the nervous system will respond to that.

- The better the information coming into the nervous system, the better the information going out from it (i.e. enables the muscles to effectively function).

- Findings by Ben Onick who was involved in the development of orthotics: One-third of patients that wore orthotics reduced over pronation; one-third showed no real difference; and one-third got worse.

- Anti-pronation orthotics should be used to work as a tool in much the same way as any other support of the body. Supporting the foot can be problematic in the same way that supporting the neck is problematic.

- Wearing neck collar for too long causes weakness and neck dysfunction in the same way that sustained wearing of foot orthotics can cause the same to foot muscles and joints. (E.g. an injured arm that had been wrapped with plaster for several weeks generally dropped about 60 percent of its original size once the plaster was taken off. This is about 40 percent atrophy in the arm muscles and would need gentle building up to get it back to full function in a few months).

- Ninety-five percent of people do not need orthotics given the right environment, the right exercises, and the right stimulus to the foot. The other five percent will need orthotics because they have conditions that need support i.e. deformities of the bones and joints due to rheumatoid arthritis and other pain conditions.

Deformities of the foot and other conditions

- Hallux valgus is when the big toe deviates toward the midline of the foot. Valgus is part of the over pronation / deconditioning pattern in the hallux.

- A comparative study between children from Germany and those from Australia showed that the former grew up constantly shod while the latter spent more time barefoot and therefore had wider, stronger, more functional feet, and much less hallux valgus and other foot deformities.

- Arguably, shod people have smaller and weaker feet while people who spend more time barefoot have bigger, stronger, and less atrophied feet.

- Individuals with painful deformity also have exostosis in the first MTP that contributes to hallux limitus / rigidus.

- With Morton's neuroma, going barefoot can help depending on the status of the connective tissues of the patients. Administer the credit card test to see if their foot reforms (creating not just the longitudinal arch but the transverse arch again). If the latter reforms then going barefoot can be useful.

- Any lateral compression can compound or aggravate Morton's neuroma so going barefoot allows the foot to splay and takes the pressure off it. But if the foot is over flattened, the nerves get compressed therefore compounding the problem.

- With hypermobility, the joints are compromised. Maximal proprioception should be given. Movement of all the 33 joints in the foot should not be blocked so that better information is sent to the nervous system then the latter sends back right information to control the level of movement of the muscles.

- With Ehlers-Danlos, one of the best ways of addressing it is muscle strengthening because this is what provides stability. But the process should be gradual.

- The tibialis posterior is used more when people forefoot strike and prevents the actual collapse of the arch.

- The tibialis anterior prevents over pronation of the foot but it gets more stressed in forefoot striking.

- Achilles problems often start with a sore calf due to forefoot striking.

- Plantar fascia accounts for 17% of people's energy absorption in running gait. The Achilles is about 35%. The moment people start to heel strike, they negate the functions of these two tissues significantly reducing the impact absorption of the lower limb. As they forefoot strike, they eccentrically load the Achilles as they land.

Earthing

- Being surrounded by electrical circuits (i.e. mobile phones, etc.) and wearing standard rubber soled shoes builds up micro voltage in the body resulting to elevated cortisol levels. Earthing is necessary in order to decrease the latter.

- The micro voltage creates a stress response in the body and taking the shoes off into earth decreases the stress response and allows the cortisol to drop. This is based on a study by Physicist James Oschman.

- The body will not repair effectively if its cortisol levels are high. If people do not earth their cortisol level stays high, if they earth their cortisol level drops down.

- By being barefoot, the body picks up free electrons from the ground, absorbed into the system and behaved like antioxidants (i.e. help heal injuries). This explains why animals heal more quickly than humans tend to because they are barefoot the whole time and are in constant contact with the ground.

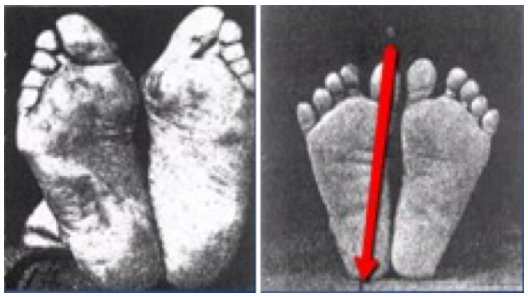
- By being able to feel the ground barefoot and allow the foot to pronate without restriction could switch on the glutes and make them work optimally.

Early civilisation

- The average age of death in agricultural civilisation or hunter-gatherers was 40 because of very high levels of infant mortality and not due to their barefoot walking. If they made it past the age of 18, they tended to live into their late 60s-70s and potentially older than that.

- There were signs of OA in the foot of historic hominids, only that the patterns are somewhat different.

- Medieval people walked differently because their shoes had softer, thinner soles – more like walking barefoot and did not heel strike. Archeological research on skeletons shows different toe formation of the medieval people – they had less arthritis in the first MTP. Shoes tend to bend the feet in and create stress on the MTP.

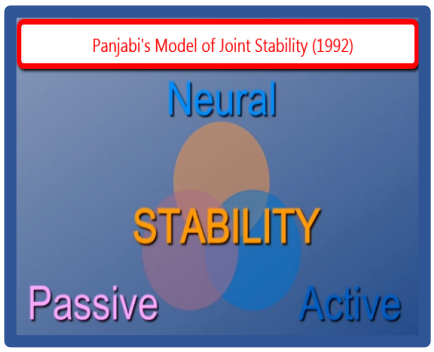


- The image on the left is the feet of an English gentleman, deconditioned from being shod all his life.

- The image on the right is the feet of an indigenous Bagabo Indian with barefoot training. When a line is drawn through the big toe, it ends up coming right through the centre of the heel – the same thing if a line is drawn from each of the second, third, fourth, and fifth toes, the lines end up through the centre of the heel like a ray. It means that as the person walks, the foot energy or loads are being transferred along a straight line.

- If something creates a bend in that straight line (mechanical force), a piece of electrical charge is created. The latter stimulates the fibroblasts/osteoblasts to lay down tissues – causing the formation of hallux valgus and other bony/joint changes.

Panjabi's model of joint stability



- Very simple model but very useful in understanding how to move. The model shows the neural subsystem at the top, then the passive and active subsystems below – they all depend on each other.

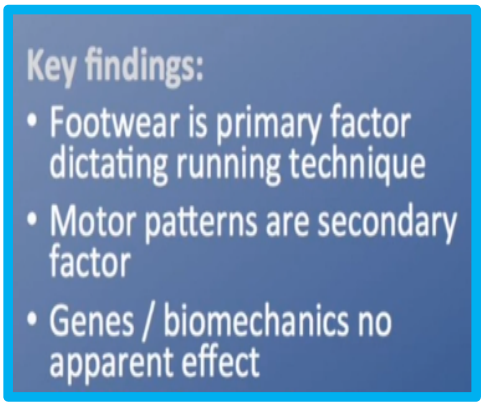
- The neural subsystem is tasked to tell the muscles what to do and how to stabilise. The muscles then do their job of stabilising or mobilising – moving the joint then the ligaments and the connective tissues hold the joint together but at the same time provide a lot of information back to the nervous system.

Lieberman research (2010)

- Subjects of the study were: Kenyans that grew up barefoot; Kenyans that grew up partly shod; and Americans that grew up shod all the time. The subjects were assessed while running across a force plate.

- <u>Key observations:</u> The Kenyans who grew up barefoot struck the force plate with a forefoot strike; Sixty percent of the Kenyans who grew up partially shod forefoot strike when they are barefoot;
  And the Americans tended not to forefoot strike at all when they are in their running shoes.

  When the subjects switched states i.e. the Americans were barefoot, Kenyans were shod:
  a) The Kenyans started to heel strike.
  b) The Americans started to forefoot strike.



- The higher the gastroc is in the calf, the more efficient the runner is. Kenyans have high gastroc.

- When individuals wear cushion shoes (regardless of their background and where they are from) they tend to heel strike. When they are barefoot, they tend to forefoot strike.

Rehabilitation

- Lunges and squats are recommended only when patients can stabilise at that level, but often they cannot. They need to start with something like a foam roller to swiss balls then progress to single leg work to more dynamic single leg work, etc.

- The period of time that progression would take depends on many factors such as: willingness of the patient to actually exercise, the overall health/condition of their organ system, the condition of their muscles, presence of pain, etc.

- During rehabilitation phase, orthotics should be used acutely. An effective corrective exercise program can go alongside it.

- Eccentric loading is used in various rehabilitation protocols to rehabilitate the muscles and is applicable for tib posterior problems.

- A treatment protocol was developed to address Achilles tendon pain that does not require surgery i.e. Alfredson's Rehabilitation Programme – involves eccentrically loading the Achilles.