



Biomechanics of the Feet

by Jill Hunter, Senior Podiatrist

A workshop for
Participants of
Triathlons, Cycling & Swimming



Perth
Integrated
Health Clinic

Outline for Workshop

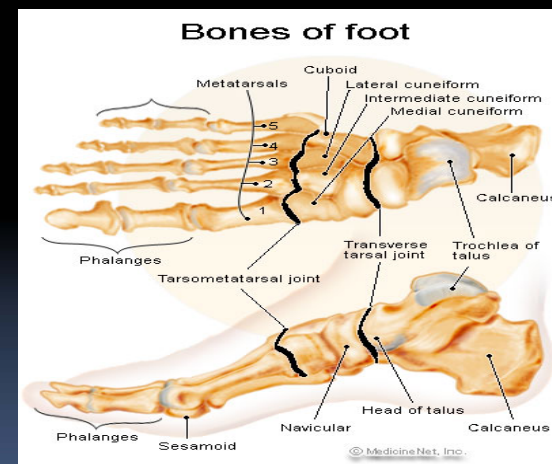
- Structure of the foot
- Movement of the foot
- Necessity of correct foot biomechanics
 - Swimming
 - Cycling
 - Running
- How to help improve function
 - Internal
 - External

Anatomy of the Foot

- 26 bones in the foot ($\frac{1}{4}$ of the bones of the body in the feet)
- 33 joints
- More than 100 muscles, tendons and ligaments
- Very complex network of nerves, arteries and veins

Sub-Talar Joint (STJ)

- Tri-planar joint
- When it moves, the rest of the weight-bearing joint move



- Can you find it on each other?

Movement of the STJ

- PRONATION
- Cushioning mechanism
- Absorb shock
- Unstable
- SUPINATION
- Really supported
- Stable platform



“Normal” Gait Cycle

- Heel Strike – Lateral Heel
- STJ pronates
- Foot Flat – mid stage of gait cycle
- STJ supinates
- Toe Off – push evenly off the ball of the foot

What's wrong with....

- EXCESSIVE PRONATION

- Body works too hard
- Over-use injuries
- Joint mis-alignment

- EXCESSIVE SUPINATION

- Not enough cushioning
- Too much stress on the joints/discs
- Pressure injuries

Swimming and feet

- To improve technique,

FEET = FLIPPERS

- Fatigued, tight feet have less strength and power
- Muscles need to fire to get the joints working properly and keep the joints in alignment

■ YES √√



■ NO XX



Cycling and Feet

- Do we need to worry about feet with cycling??
 - YES!!
- Cycling has the same pressure on the feet as running but without the shock/force of hitting the ground
- To improve power, keep the feet within neutral range

Excessive pronation/supination??

- Feet??
- Ankles??
- Knees??
- Hips??
- Lower Back??
- Shoulders??
- Movement??
- Grip??



Running and feet

- Running increases the shock in the feet/body by between 4-8 times



- Without correct support, this absorption of shock makes the body work up to 30-40% harder

Complications with poor running style

- Shin splints – increased work for shin muscles
- Joint arthritis – wear and tear due to misalignment
- Muscle strain/tear – muscle fatigue due to overuse
- Aching feet – muscles getting tired and damaged from increased work

Improve function - INTERNAL

- **Soft tissue work**

- Aim to improve the blood supply to the muscles of the feet, increasing the inflammatory response to clear the toxins
- Cross-friction across the muscles to get rid of the scar tissue that builds up
- Re-train the muscles to work differently to improve the function, long-term

Improve function - INTERNAL

■ Calf muscles

- Tight calf muscles increase the compensation of the STJ, causing more pronation
- They also cause more tension on the plantar aspect of the feet as they attach
- Stretching is necessary to increase the ROM



Improve function - EXTERNAL

FEATURES TO LOOK FOR IN A STABLE SHOE

- Stable heel counter
- Stable Upper
- Stiffness in the mid-sole
- Laces / Buckle / Strap
- Dual density sole



Improve function – EXTERNAL

CONT...

- Light-weight
- Comfortable
- Correct Size
- Correct Fastening



Improve function – EXTERNAL

- Orthotics
 - Work to reduce the ROM to within the neutral range
 - Improve the efficiency of the feet/legs
- Two types
 - OFF-THE-SHELF
 - FUNCTIONAL



Further Information

Thanks for your time. Participants of this PIHC workshop are entitled to a complimentary biomechanical Podiatry assessment with...

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