Pathomechanics first, orthoses 2nd…or at all?!

Mandy Abbott & Nick Gallogly

What is Pathomechanics?

This is the understanding of mechanical factors that can contribute to or result in musculoskeletal dysfunction and possible injury

These mechanical factors include: forces, loads and/or movement patterns

Intrinsic and extrinsic factors associated with injury

Intrinsic

Gender

Body weight

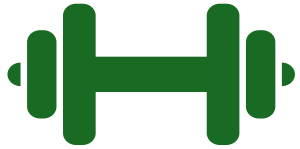
Age

Anatomical variation

Biomechanical factors

Fitness/skill level

Sleep/nutrition/stress/psychological issues



Extrinsic

Equipment (incl . Footwear)

Training errors

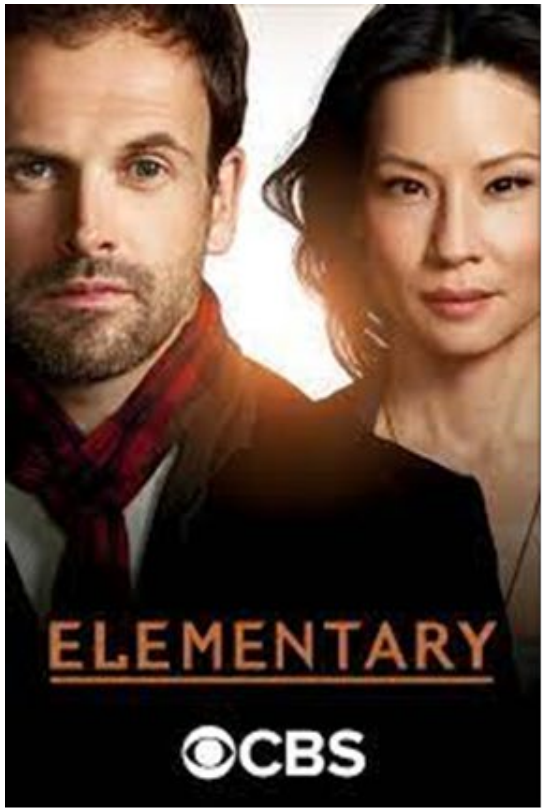
Weather conditions

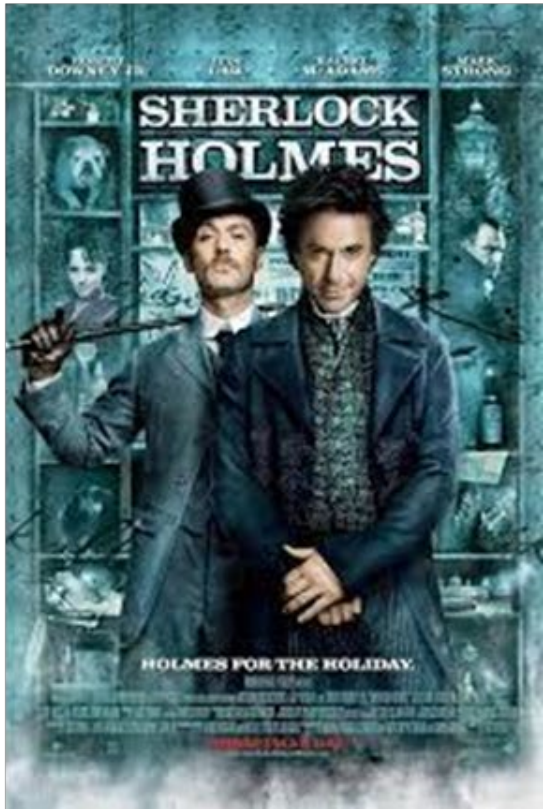
Surfaces

Load V’s capacity and injuries

Cook & Docking (2015)

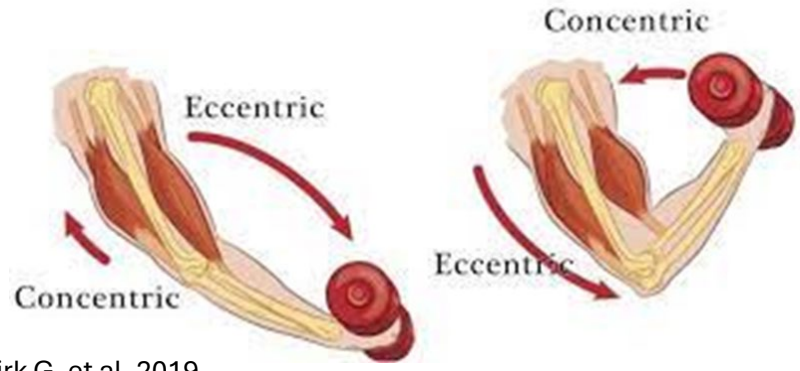
In order to identify the most appropriate intervention, we must try, where possible to understand the pathomechanics or how tissue has become overloaded and where the deficit lies





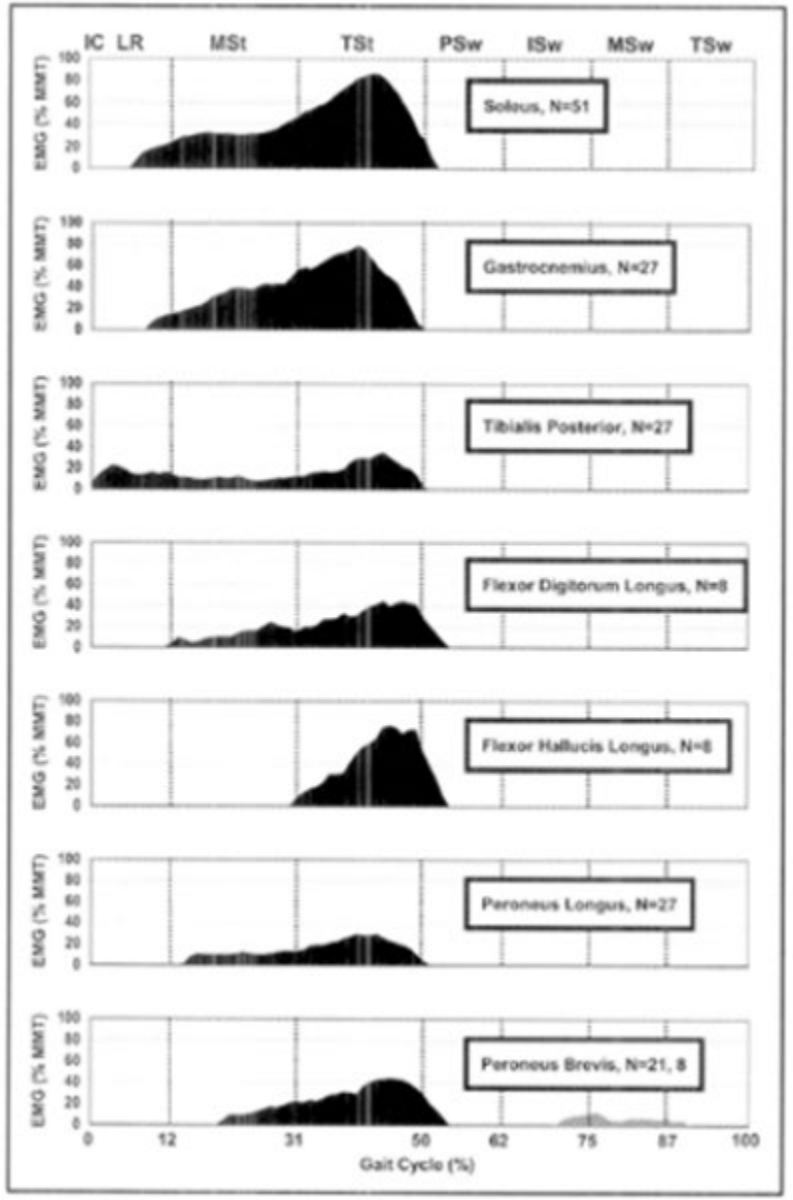
But first the basics

The importance of functional anatomy



Kirk G, et al, 2019

Sure, but what about when and for how long



Perry, J, 2010

"This one goes to 11!"

Pathological planes of dominance

Sagittal Primary plane

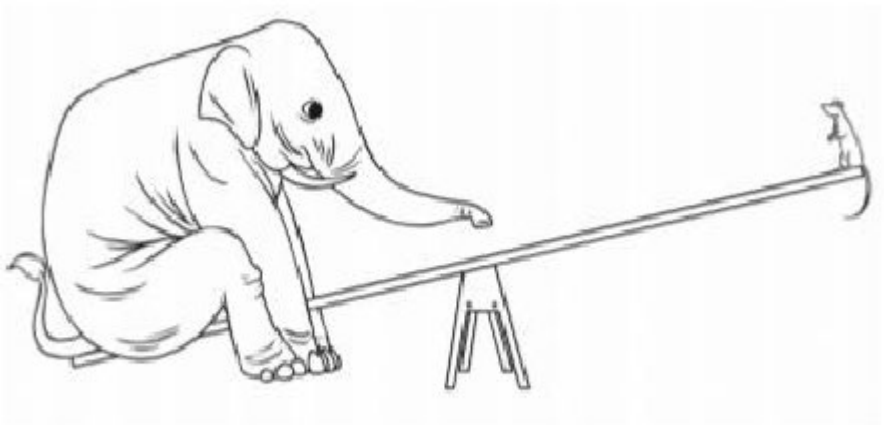
Frontal Primary plane

Transverse Secondary plane

Mechanism of injury

“I was walking up Kilimanjaro” Vs “I was out in the garden”

A balanced response



We must understand the pathomechanics of why there was increased load on the pathological tissue in the absence of an obvious mechanism

And our intervention must be a balanced

And remember

With a deficit or pathology in one structure, comes a cascade of deconditioning in other structures.

Ligamentous attenuation

Compensatory movements

De-conditioning

Understanding the sport is important





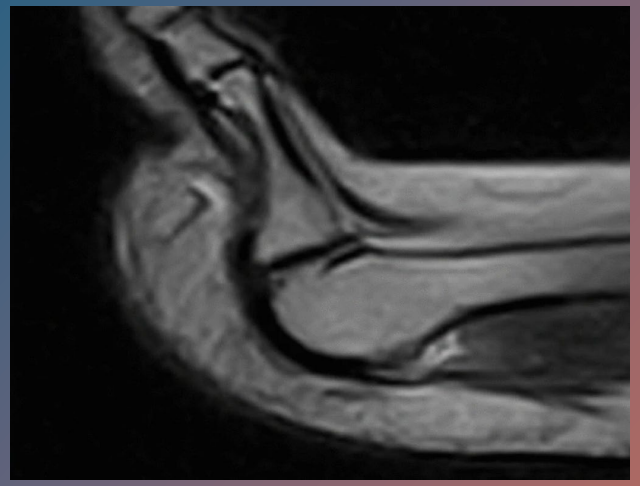






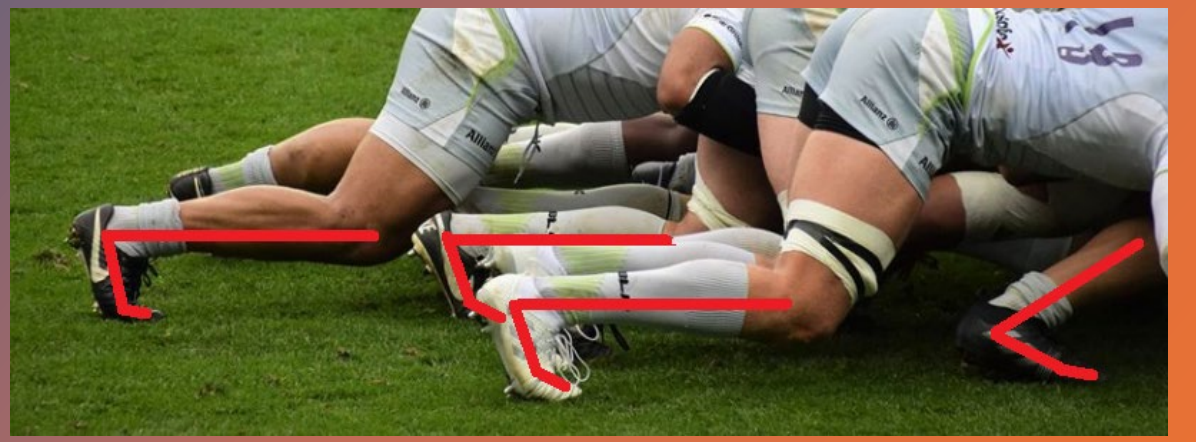


Turf toe / plantar plate injury



Giuliani, A. et al, 2024

Gupta, A et al 2023.

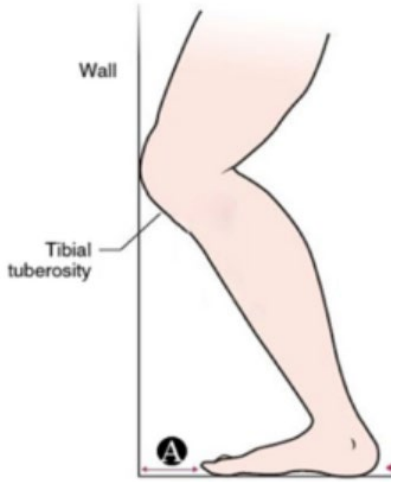


- Classification (Clanton et al, 1994) (Anderson et al, 2010)
  - Grade I (Capsular sprain)
    - Full ROM, ability to WB
    - Normal radiograph
    - Intact soft tissues
  - Grade II (partial plantar plate tear with capsule)
    - Swelling with reduce ability to WB
    - Pain at EROM
    - High signal on MRI but not full through plantar plate
  - Grade III (plantar plate rupture)
    - Swelling and inability to WB
    - Full thickness tear to plantar plate
    - Associated injuries likely – sesamoids /dorsal joint impact

Management

Gupta, A et al 2023.

Mr Maneesh Bhatia, 2025



Gupta, A et al 2023.

Mr Maneesh Bhatia, 2025

Gupta, A et al 2023.

Pes cavus foot type: Badminton player with sesamoiditis

Plantar flexed 1st

In badminton players: pathomechanics

- Ankle joint restriction = Early heel raise due to limited ankle joint ROM
- Midfoot stiffness
- Stiffness in 1st ray

- All of the above increase the load over the fore foot. = injury

(Chen et al, 2020)

How to approach management

Perhaps 1st line management?

Manage pathomechanics

Improve ankle joint function:

Stretching (Konrad et al., 2024)

Mobilisation (Kim & Moon, 2022)

Improve 1st ray and midfoot stiffness:

Exercises &/or mobilisation

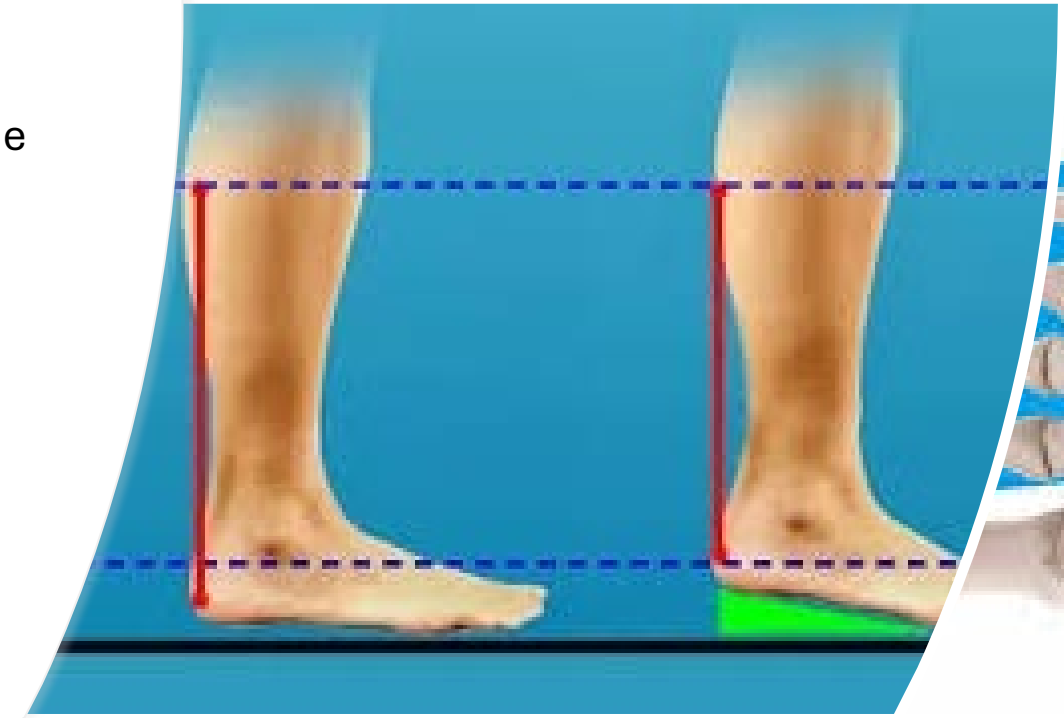
Management of pathomechanics

What can orthoses do?

- Heel raise: to improve ankle joint ROM

(Johanson et al. 2006)

- 1st ray cut out: to allow the 1st ray to pl flex and prevent overload under met head and reducing the inversion moment locking the mid foot.



Summary: Managing the Pathomechnics

We now understand the mechanical factors that can contribute to or result in musculoskeletal dysfunction and possible injury

We can now manage these mechanical factors: forces, loads and/or movement patterns

Key take home messages

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