Optimising Running Performance

Presented by Össur & Running Coach Brett Jones

Running

- Its supposed to be easy, fluent and fun
- For many of us it is a challenge to do it well,

  and to do it injury free.
- Kids tend to run well naturally
- Somewhere along the way, things go wrong & we need to hit refresh 

Mechanical Vs Technical Issues

Mechanical	Technical
• ROM • Pain • Strength • Innovation • Illness/injury • Equipment	• Concept & Understanding • Thoughts • Cues • Language • Inputs (internal & external), our thinking

Mechanical Drains

Where Energy and Effort are Wasted

- **Poor Posture**
- **Co contraction**
- **ROM (too much/too little)**
- **Counter Productive Lateral & Rotational Movements**
- **Strength Deficits**
- **Poor Coordination**
- **RFD – muscle type/age**
- **Energy System Capacities**
- **CNS and Peripheral Innovation – fatigue**
- **Mental Focus**

Posture

- Position from which all movement begins and ends
- Specific to sport and needs
- Specific to directions of travel, forces and intensity

A Runners Posture is ROCK SOLID

Similarities seen across sports
With only some minor variations
Doesn't change, relationship to the ground alignment/angle direction of travel, will change.

Amputees must be strong & stable

fontal, sagittal and transverse planes

Sprinting Posture

- Forearms and shins parallel
- Shoulders and hips Parallel (square)
- Line of drive(toe knee, hip, shoulder, ear)
- Foot and thigh parallel
- Neutral spine
- Torso Held in Isometric Position whilst limbs rebound around it.

Sport Specific Postures

Acceleration Deceleration and Change of Direction

Range of Movement

Efficiency & Economy
Injury Prevention
Perform movement and skills of sport through full ROM

Right leg for the right job

Technical Drains

How our concepts of running get in the way

Speed = SL x SF

- It was once thought that Speed = SL x SF and in manipulating one would or the other would create more speed. This is true at a very basic level.
- However it is now noted that both SL & SF are reliant on speed and that they are a consequence of speed, not a cause of speed.
- In actual fact Weyands research suggests that SF varies little between sprinters and therefore has only a small determining factor on Max V.
- However increases in speed (horizontal velocity) actually create increases in both SL & SF. SL is improved through distance travelled whilst in the air.

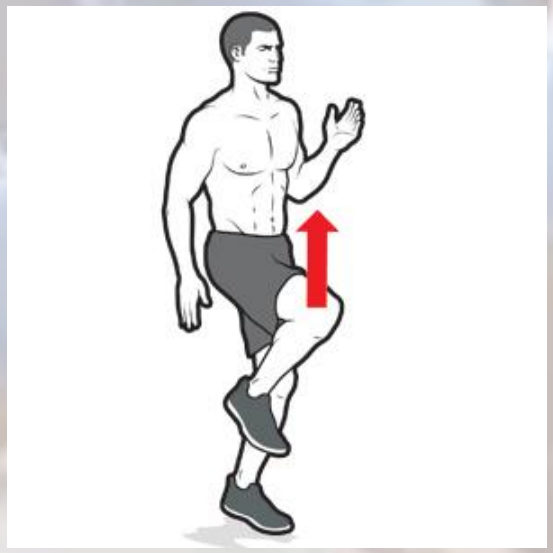
Sprint Research

- Speed is a combination of both nature and nurture – The Sports Gene = it can be trained.
- Flight time is comparable across running speeds – Weyand
- Frequency is capped approx 5/sec similar across most top athletes – minimal differences – Weyand
- Top Sprinters apply more **vertical** forces early in contact/stance phase – Weyand
- Top Running speeds are achieved by greater ground forces not faster cadence- Weyand

Common Cue and Coaching Errors

- Knees up cue not foot down, must promote ground contact forces.
- Pelvis position – anterior/forward tilt
- Over striding – increased ground breaking forces = Reaching and pushing/ push pull running
- Over pushing (horizontal force dev.) in Maximum V or constant speed running
- Incorrect limb recovery during swing phase (delay in knee forward recovery)
- No elasticity in the MTU
- Lack of lateral hip strength and ability to stabilise the pelvis.
- Poor rigidity/stiffness in the support phase. (collapse at foot, knee & or hip)
- Fast feet to reduce GCT
- Pulling/clawing foot backwards at early contact phase
- Quickness is not speed. – we need both force and quickness to run fast.

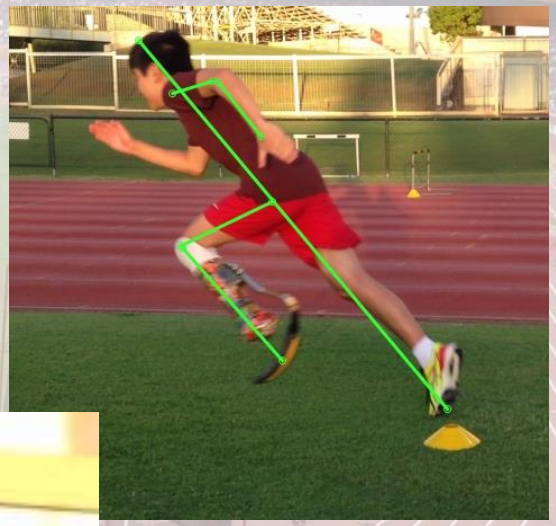
Vertical Ground Reaction forces are King



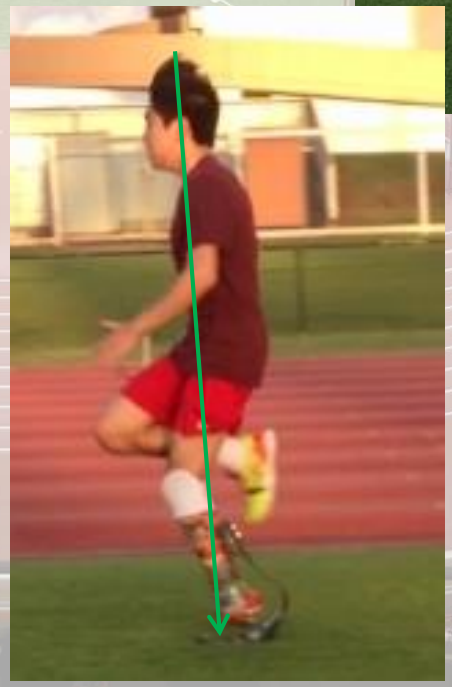
- Knees Up does not work to promote vertical force development
  - Elasticity/spring
  - Efficient posture

Down Down Down

- You have to generate ground reaction forces in the direction of travel



- Equal Vertical and horizontal forces in early acceleration



- Vertical forces in Constant velocity running

Over reaching

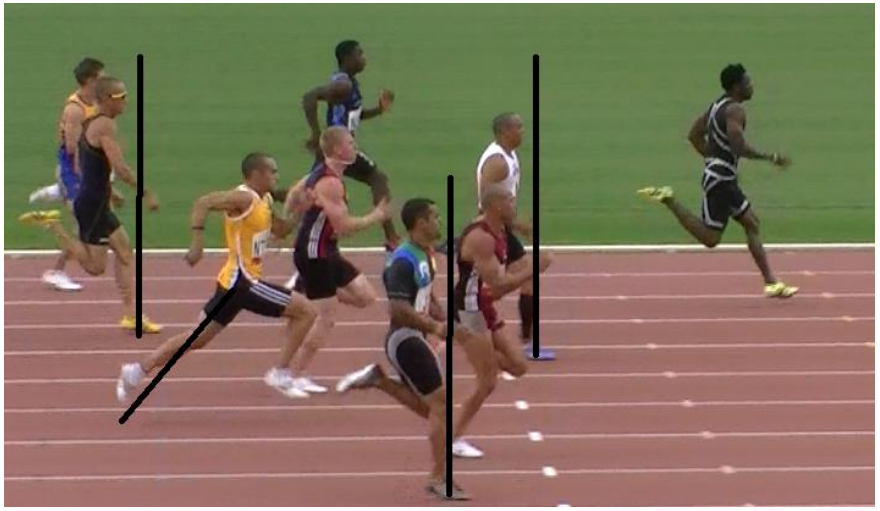
When we try to lengthen our stride by reaching

Overstriding is a runners nightmare

Stride Length increases through: "Projectile Motion"

- Height of release
- Angle of release
- Velocity of release

Minimise Ground Breaking forces



- 2cm every step for 50steps could mean you are slowing down for 1m/100m.

Ground Breaking forces are like driving your car with one foot on the accelerator while pumping the breaks

Foot contact under hips

Hip Extension

- 8-14Degrees
- Any more than that and we are prone to over striding
- Reducing hip height at toe off
- Decreasing cadence by placing additional demands on pelvis and trunk stability
- Increased trunk rotation
- Increased likelihood of ground breaking forces – equal and opposite forces

Maximum or Constant Velocity Running

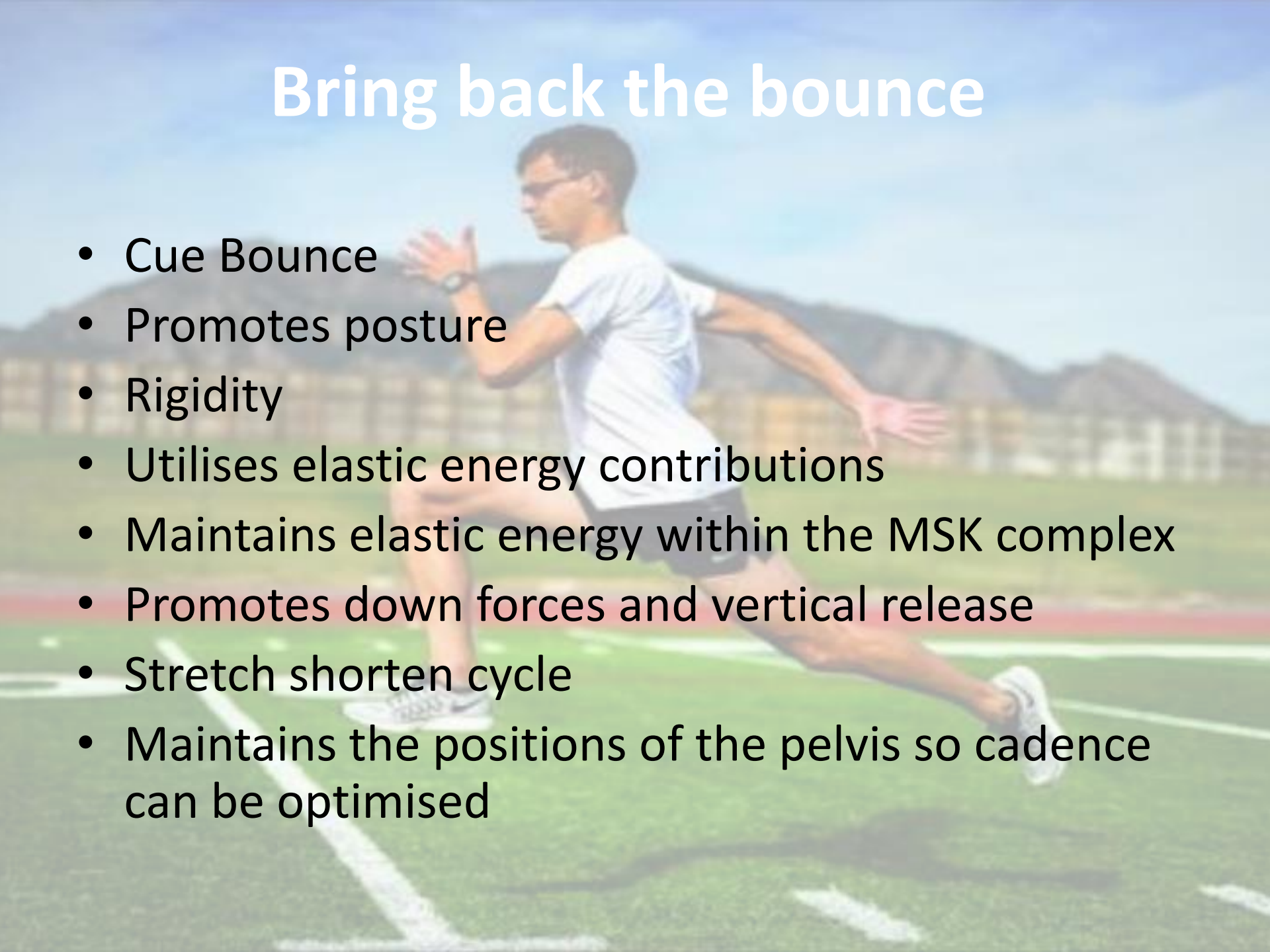
Gallipoli the Movie

- ”What are your legs?” “Steel springs.” “What are they going to do?” “Hurl me down the track.” “How fast can you run?” “As fast as a leopard?”

- This spring model works well in Amputee running.

Spring

Bring back the bounce



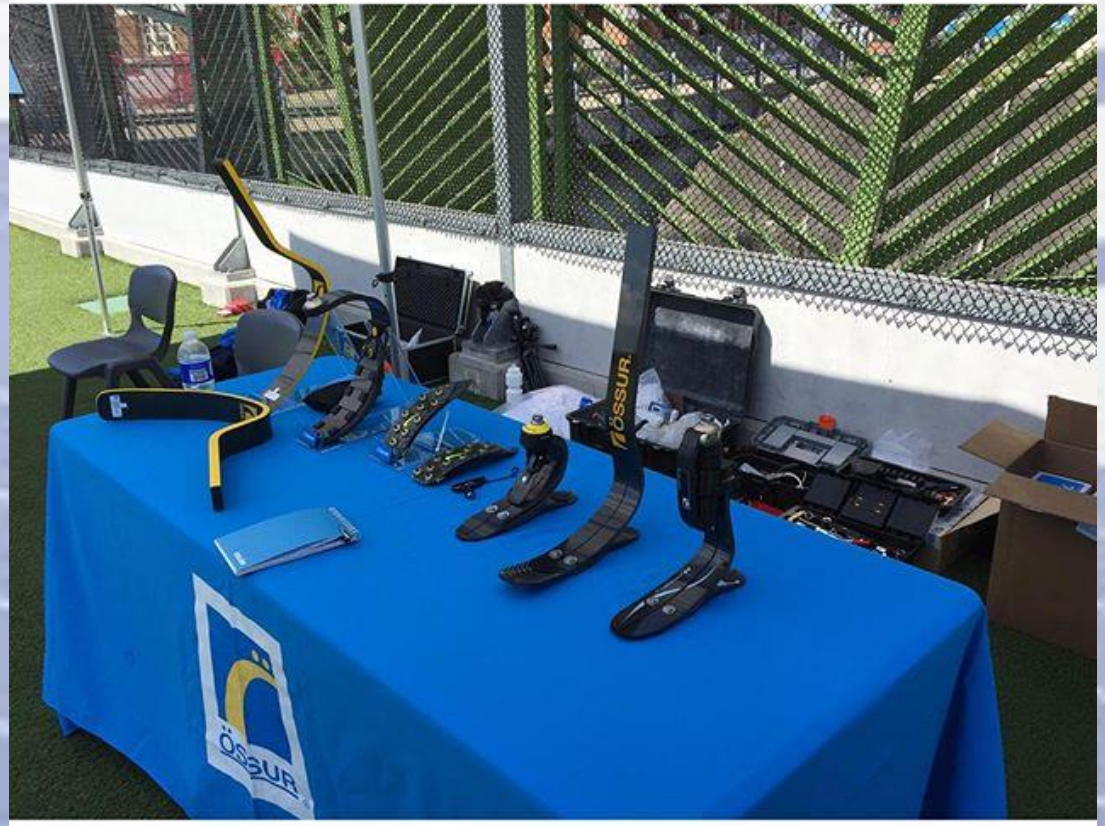
- Cue Bounce
- Promotes posture
- Rigidity
- Utilises elastic energy contributions
- Maintains elastic energy within the MSK complex
- Promotes down forces and vertical release
- Stretch shorten cycle
- Maintains the positions of the pelvis so cadence can be optimised

Ground Reaction Forces

- We need to create forces from the knee high/ hip position
- Down forces into the ground will generate vertical ground reaction
- Generating height and propulsion/lift off.

Prosthetic Set Up
Possible considerations

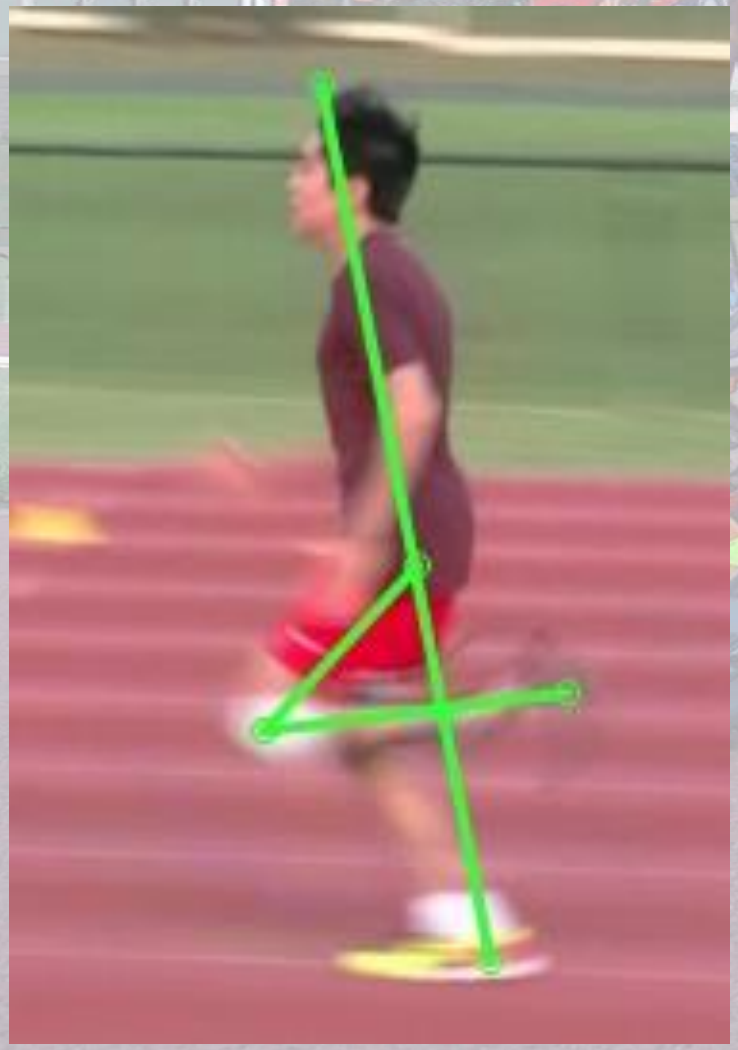
- Height & Leg Length
- Category
- Socket and Suction
- Alignment
- Components
- Type (knee, foot , suspension)



How does Use affect Set Up

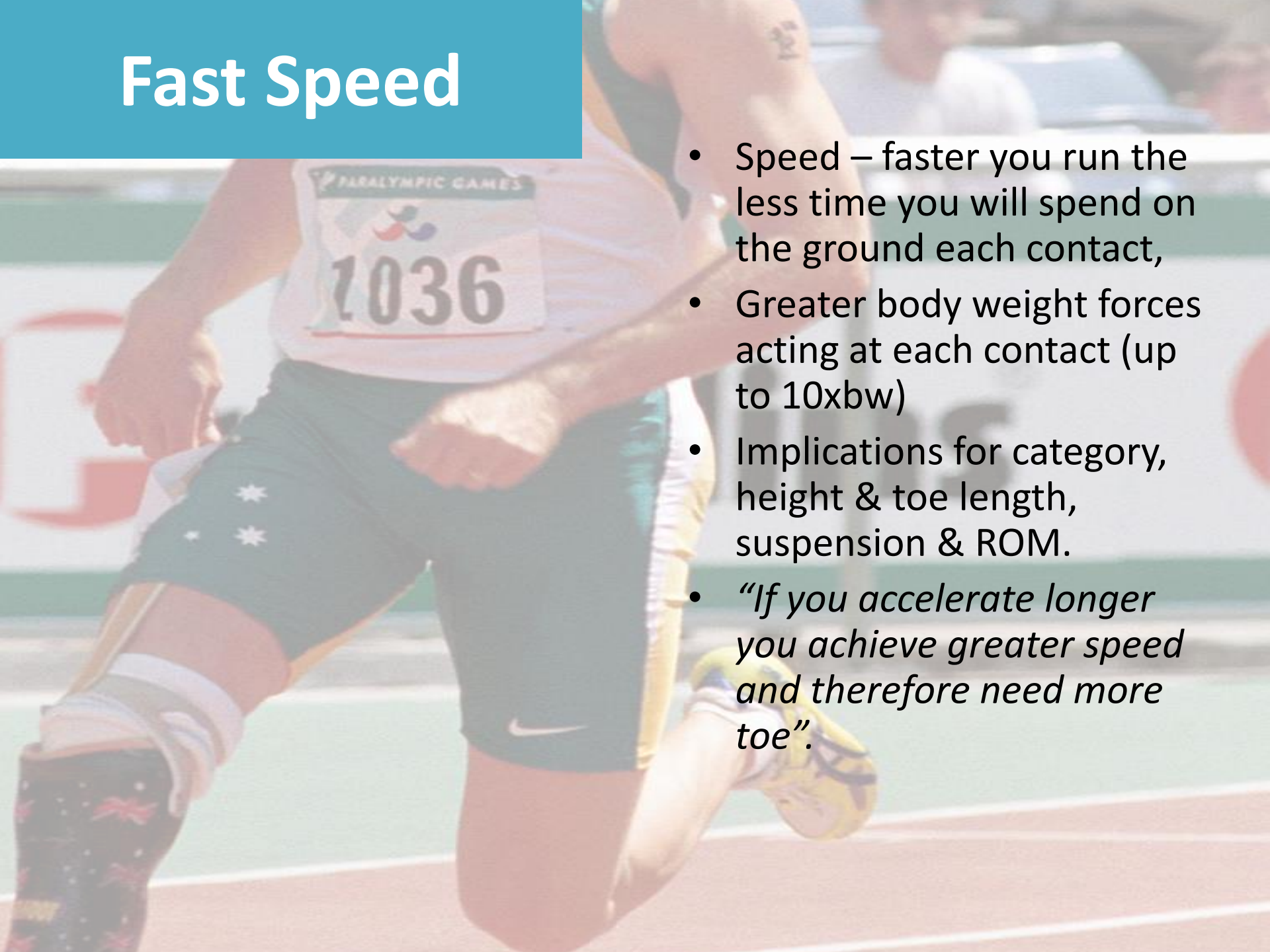
- Team sports & sprinting more acceleration so need more toe available and maybe some external rotation.

How does Use affect Set Up



- Faster you run the greater leg cadence and the greater ranges at hip and knee required.
- Sockets and suspension systems need to maximise flexion at the knee and allow fast and smooth leg swing.
- Otherwise symmetry is altered & body rotations increase.

Fast Speed



- Speed – faster you run the less time you will spend on the ground each contact,
- Greater body weight forces acting at each contact (up to 10xbw)
- Implications for category, height & toe length, suspension & ROM.
- *“If you accelerate longer you achieve greater speed and therefore need more toe”.*

Slower Speeds

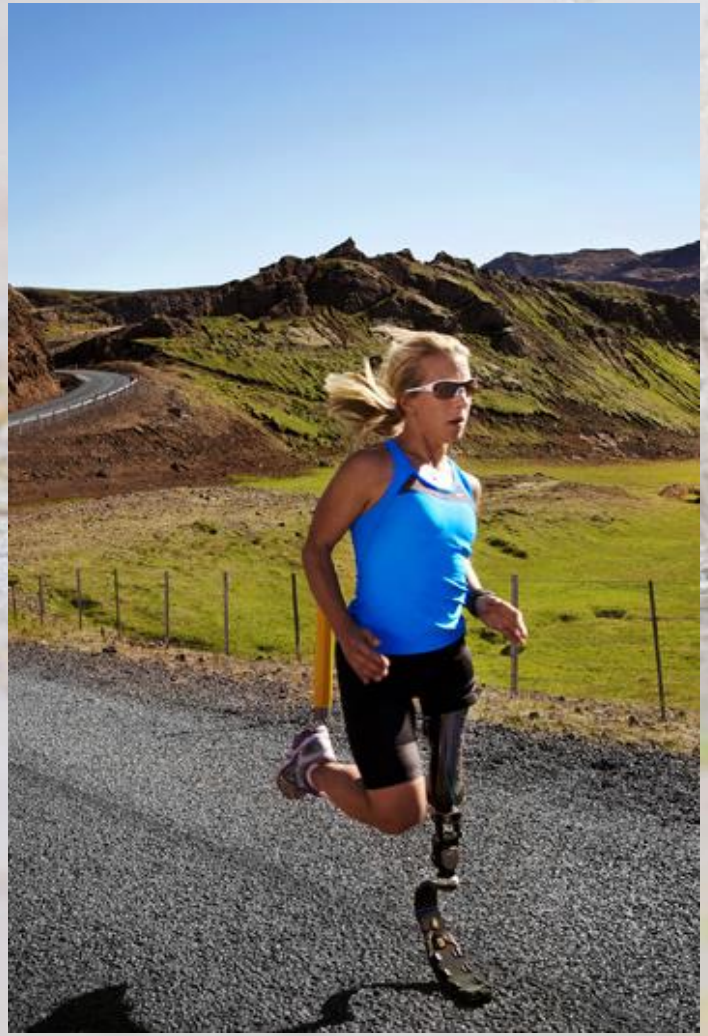
- Slower you run the more time you spend on the ground & less time you spend accelerating.
- The more time you also spend in upright postures
- Implications on category, height and toe position.

Deceleration & Change of Direction

- We accelerate and decelerate with our heels and toes

HOW DO I ASSESS SUCCESS

Symmetry & Ground Contact Times



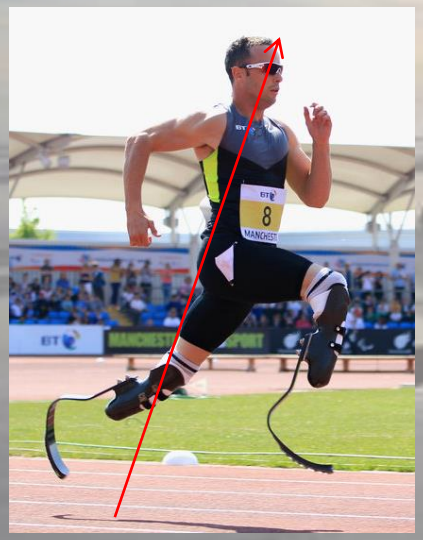
- Can be easily measured with a digital camera
- Symmetry left to right
- Number of frames

  L Vs R =

Front On

- Hips and shoulders square
- Hip height balanced at full support
- Tight to COM
- Balanced rotation

Side on



Height maintained at Toe off
Line of drive (toe to ear) Controlled Hip Extension
Projection Up & Forward

Forward trunk lean

Foot contacts ground under hips
Minimal Collapse (@hip/knee)

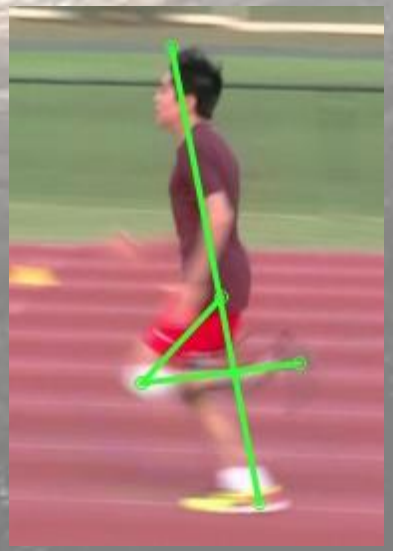


Figure of 4 Shape at full support (when foot is under hips and heel down)
No sitting posture or leaning back

Rear View

- Shoulders Square
- Hips square
- Lateral drift /hip
- Width of arm swing
- Hair Swing (pony tails)
- Heel Height Symmetry
- Foot collapse /Pronation & alignment

A Drills or the “Down Drills”

- Walking Drills
  - Tip Toes
  - Heel toes marching
  - Crab Walks
  - Straight Legs
  - Kareokes
- Skipping Marching Drill
- Single leg Marching Drill
- Down Down Down on Cones
- 10/10/10m small medium large – Running March or Running A Drill

When we get it all done!

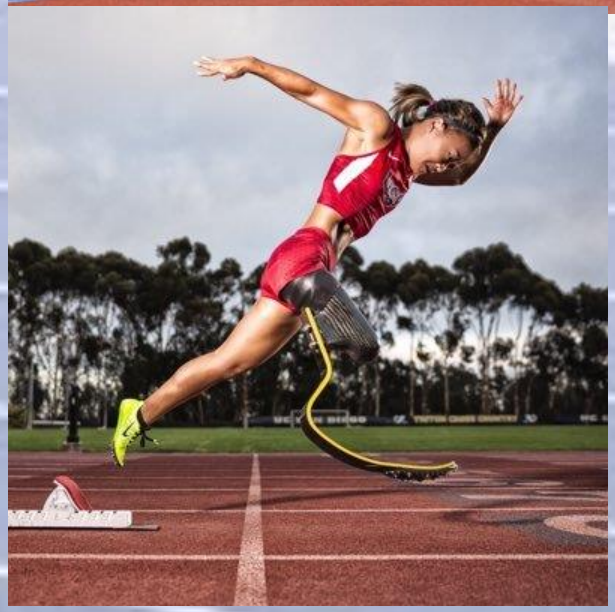
We perform the same

There are more similarities than differences

Our abilities are similar

And we can compete against our peers

We may become a champion



Or compete for medals

Or we may just enjoy a run or a game with friends

Brett Jones

Special Thanks

- The Össur Team
- Peter Brown – video model

w. therunproject.com.au
e. brett@therunproject.com.au
t . @therunprojectau