
Strength & Conditioning
Meets Sport Technology:
Some Thoughts
AUT SPORTS PERFORMANCE
RESEARCH INSTITUTE NEW ZEALAND
AUT
RESEARCH & INNOVATION

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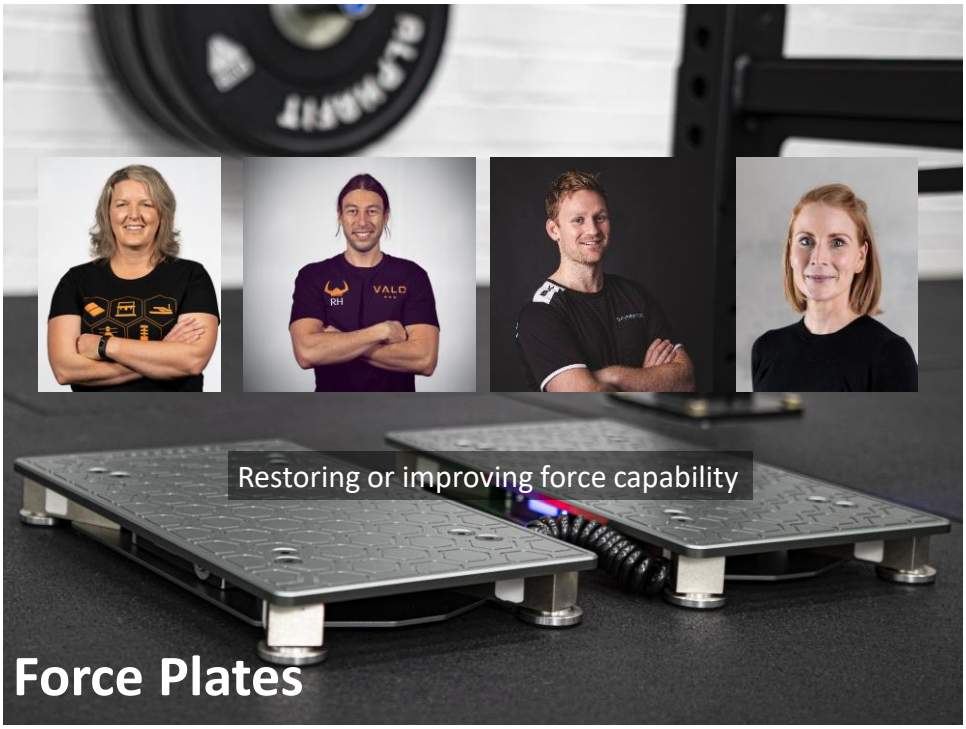
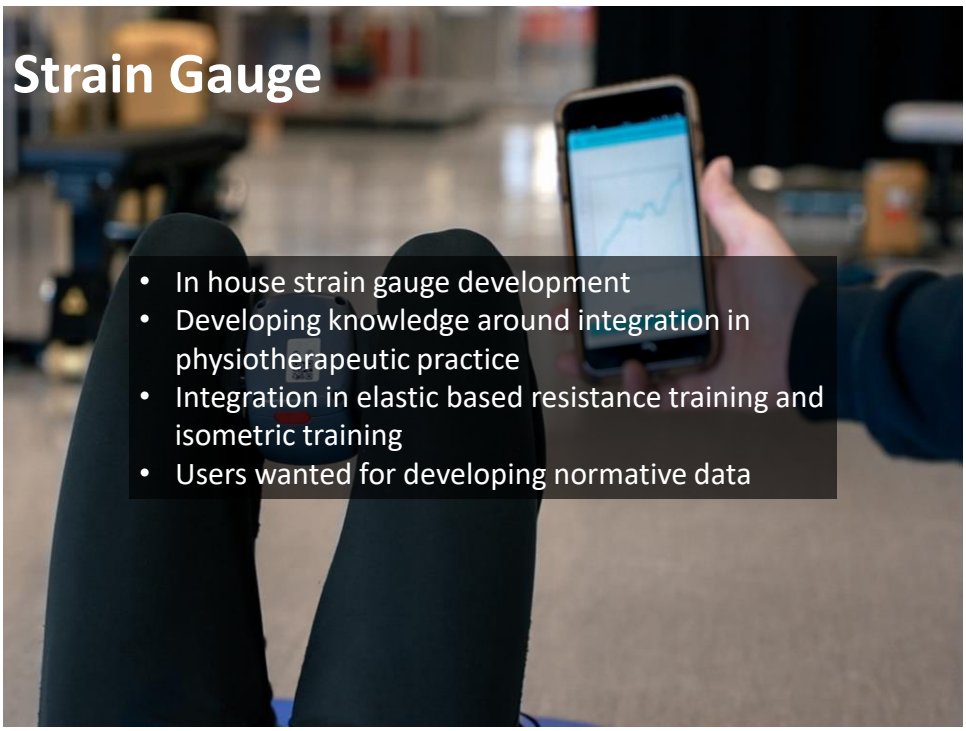
Accessibility
Portability
Complexity
Simplicity
Industry ready
Force Plates

2


Restoring or improving force capability
Force Plates

3


Strain Gauge
• In house strain gauge development
• Developing knowledge around integration in physiotherapeutic practice
• Integration in elastic based resistance training and isometric training
• Users wanted for developing normative data

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Strain Gauge

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Wearable Vibration Therapy
MYOVOLT
Reduced soreness
Increased flexibility
Muscle activation
Recover faster
Independent clinical studies
Lower back pain
Peripheral neuropathy
Multiple sclerosis

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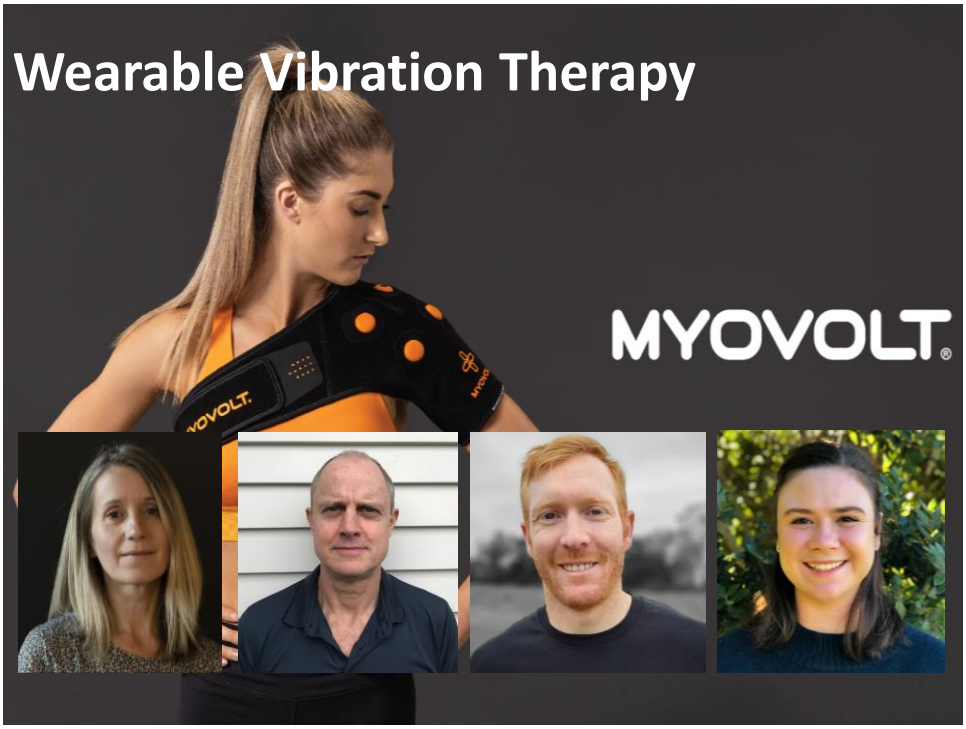

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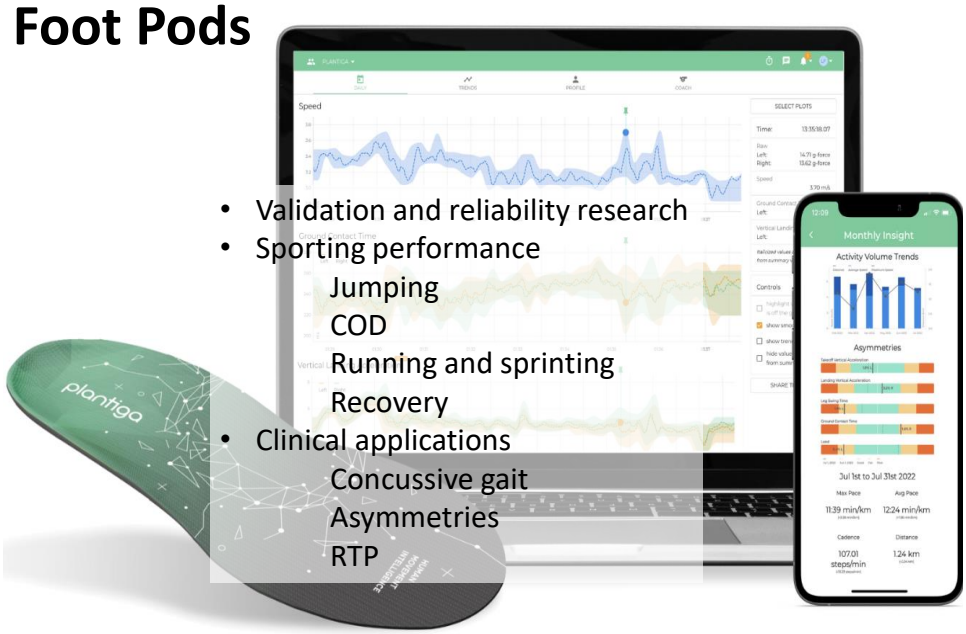
Foot Pods



- Validation and reliability research
- Sporting performance
  - Jumping
  - COD
  - Running and sprinting
  - Recovery
- Clinical applications
  - Concussive gait
  - Asymmetries
  - RTP

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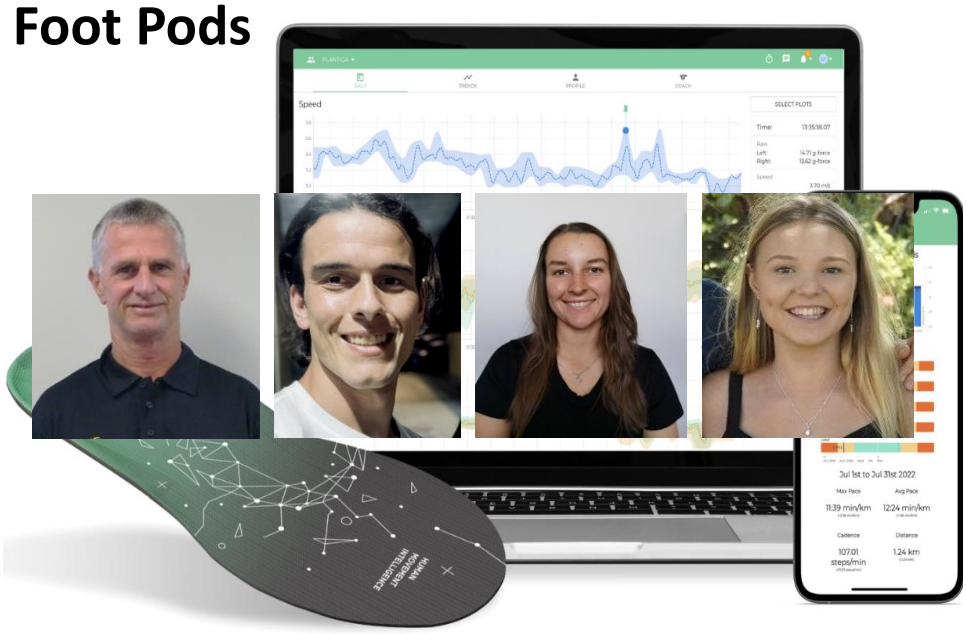
Foot Pods



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Work-Energy Relationship

Mechanical Work - Muscular Work - Metabolic Work

$KE = ½m.v^2$
$= ½\ 100 \times 0.58^2$
$= 50 \times 0.34$
$= 17.4$ kg.m.s

$KE = ½m.v^2$
$= ½\ 1.0 \times 6.1^2$
$= 0.50 \times 37.2$
$= 18.6$ kg.m.s

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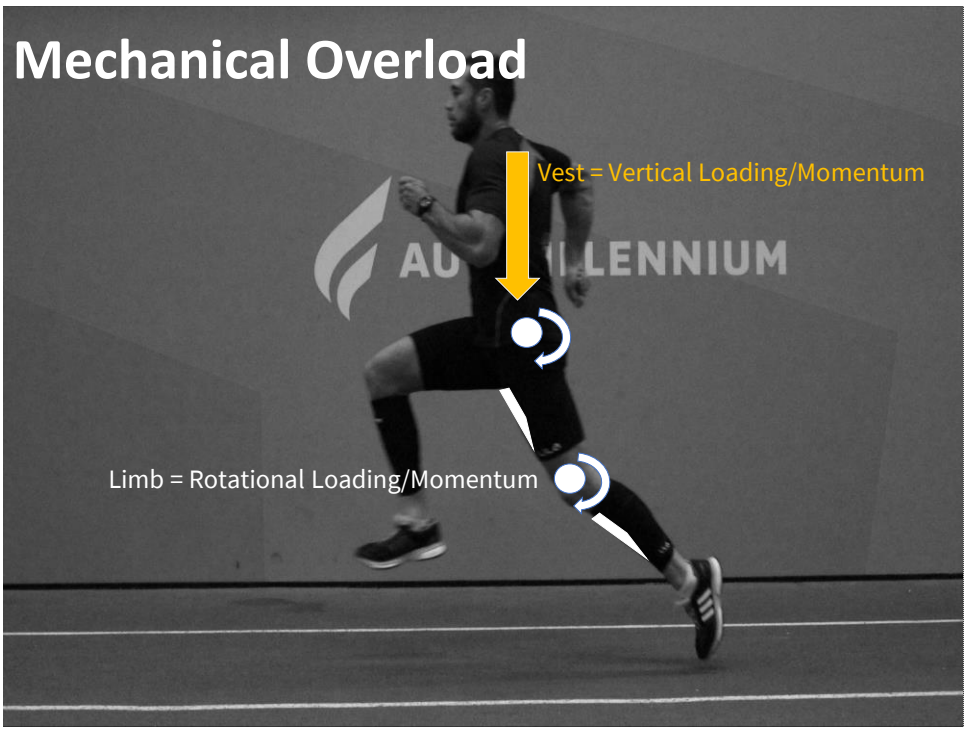
Mechanical Overload



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Stride Length

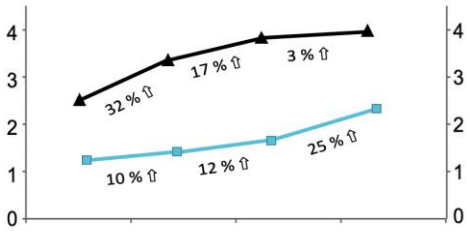
Speed increase at lower speeds = Stride Length

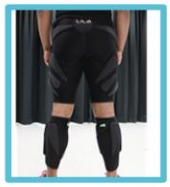
Vest loading is ideal for overloading the ankle plantarflexors, soleus and gastrocnemius, improving vertical support forces

Stride Frequency

Speed increase at higher speeds = Stride Frequency

Limb loading such as weighted shorts is ideal for improving step frequency via the strengthening of the iliopsoas, gluteus maximus and hamstrings





Adapted from Dorn et al (2012)

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Swing Phase Loading

A two for one - stance and swing phase overload

Whip From The Hip

Thigh angular velocity was strongly related to running speed

Clark et al. (2020)

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Quantifying Workload

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Flywheel Resistance Training

How It Works

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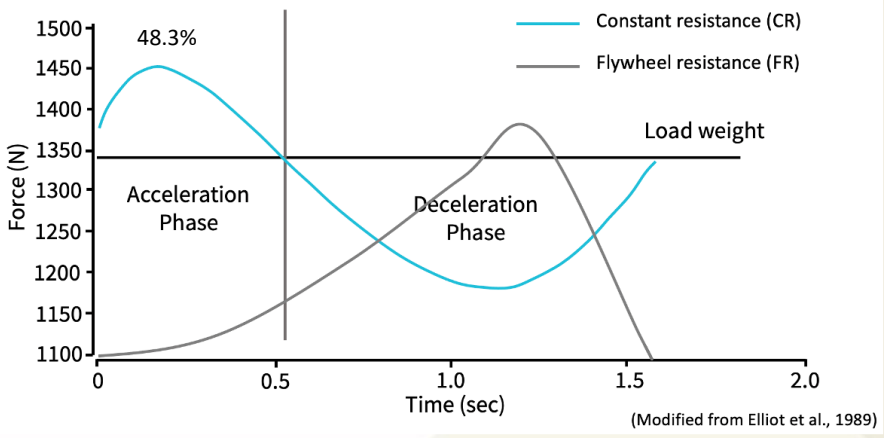
Flywheel Concentrics

Concentric Overload



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Flywheel Eccentrics

Eccentric Supramaximal Overload

- More effort put in the concentric phase, the more you get out of the eccentric phase
- Different strategies can be used when FRT
- FRT can enable faster descent or eccentric contraction rates
- Safe form of submaximal and supramaximal eccentric training

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Rehabilitation – User Defined

- Injury prevention
- Training after a period of unloading
- Tendon and muscle rehabilitation
- Post-operative rehabilitation
- Late-stage sport specific rehabilitation
- Falls prevention
- Treatment of sarcopenia

Jaap Wonders (2019)

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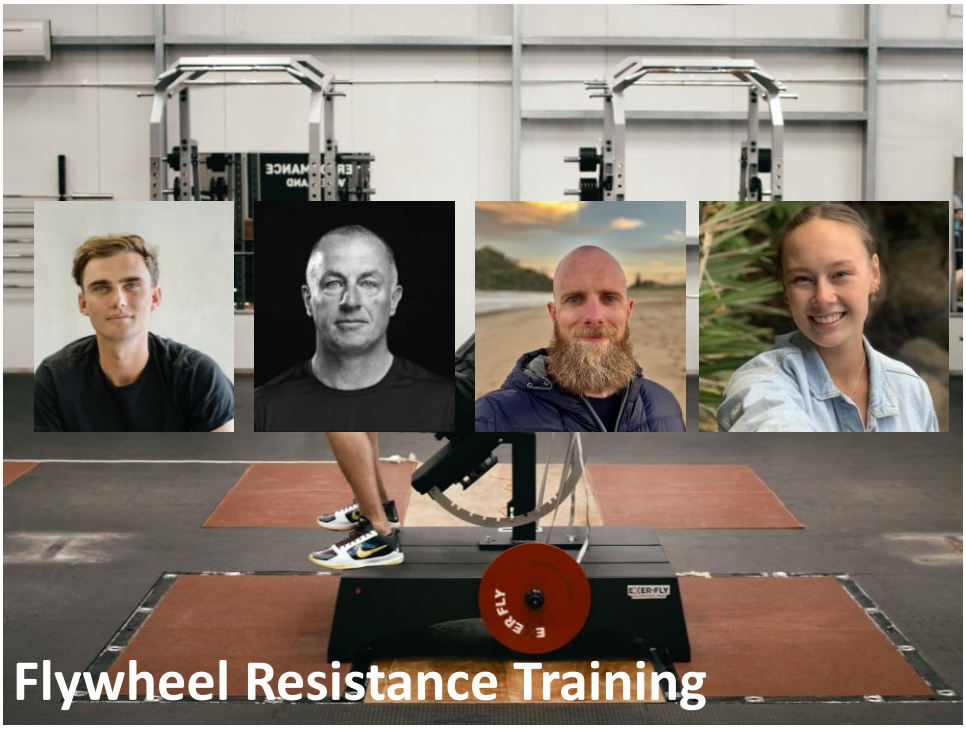

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Enjoy Your Days

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