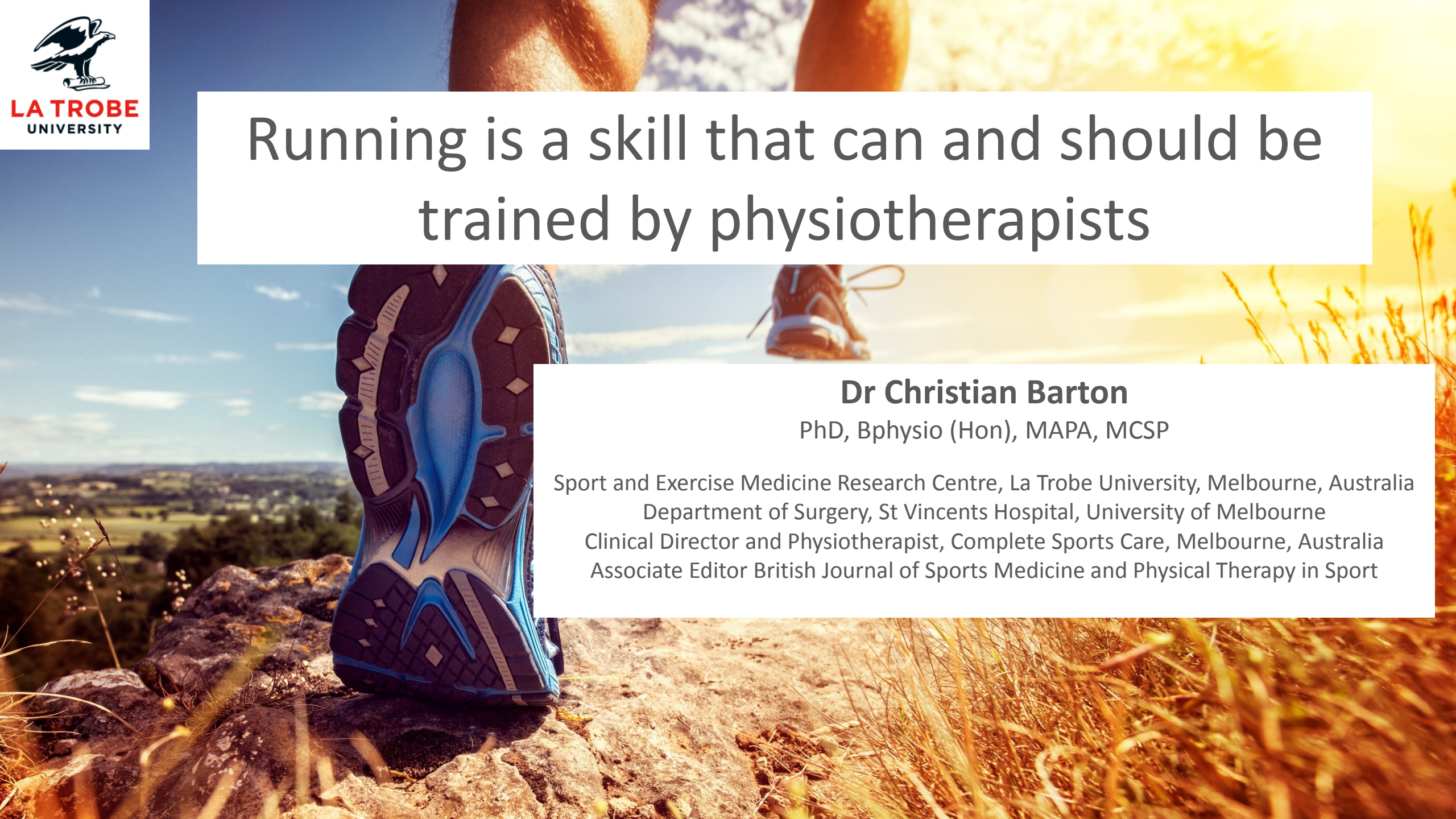

Running is a skill that can and should be trained by physiotherapists

Dr Christian Barton

PhD, Bphysio (Hon), MAPA, MCSP

Sport and Exercise Medicine Research Centre, La Trobe University, Melbourne, Australia
Department of Surgery, St Vincents Hospital, University of Melbourne
Clinical Director and Physiotherapist, Complete Sports Care, Melbourne, Australia
Associate Editor British Journal of Sports Medicine and Physical Therapy in Sport

A little about me

BJSM The Journal of Sport & Exercise Medicine | BMJ Journals

TREK TRANSLATING RESEARCH EVIDENCE AND KNOWLEDGE

LA TROBE UNIVERSITY

THE UNIVERSITY OF MELBOURNE

semrc.blogs.Latrobe.edu.au

OUTLINE

1. Why is running important?
2. Framework to manage the RISK of running
3. Is there evidence for running retraining?
4. How might you assess and retrain runners in your clinic?

PROGRESS IN CARDIOVASCULAR DISEASES 60 (2017) 45–55

Available online at www.sciencedirect.com

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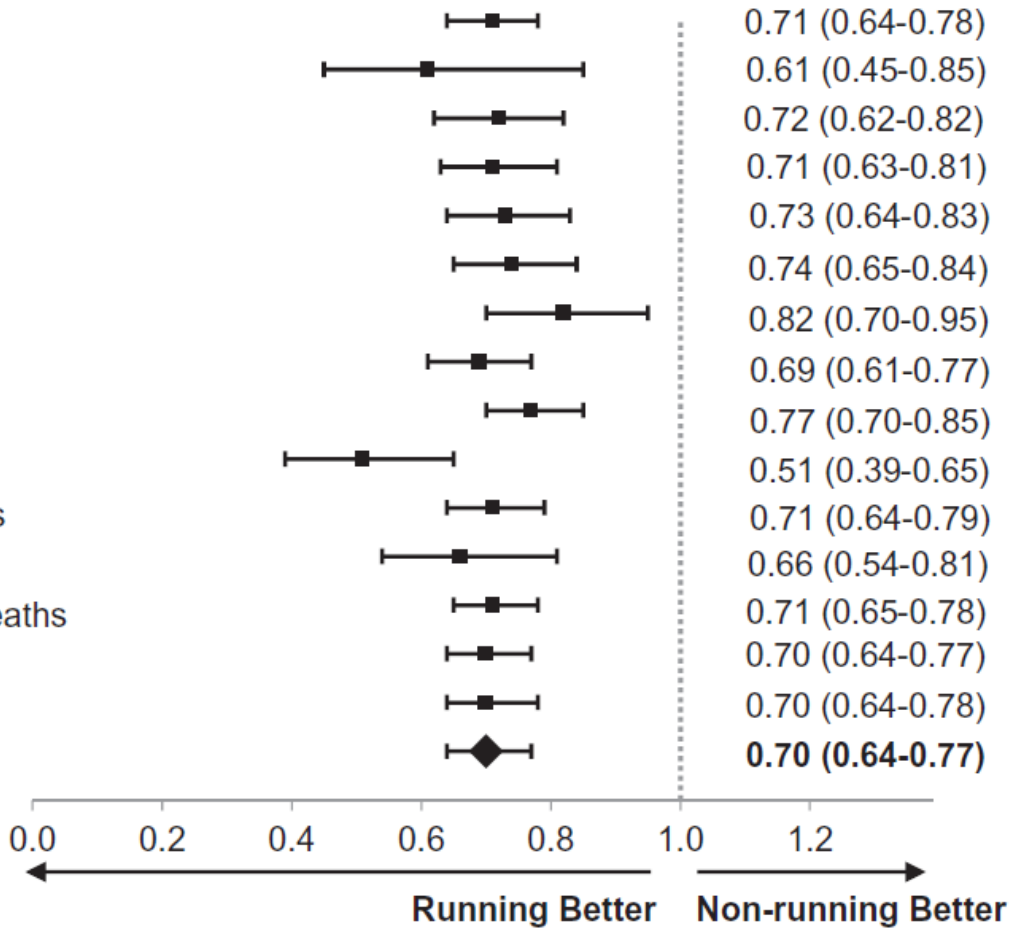
Progress in Cardiovascular Diseases

Running as a Key Lifestyle Medicine for Longevity

Duck-chul Lee[a,], Angelique G. Brellenthin[a], Paul D. Thompson[b], Xuemei Sui[c], I-Min Lee[d], Carl J. Lavie[e]*

Subgroup	Hazard Ratio (95% CI) of All-Cause Mortality
Men	0.71 (0.64-0.78)
Women	0.61 (0.45-0.85)
Age <50 yr	0.72 (0.62-0.82)
Age ≥50 yr	0.71 (0.63-0.81)
BMI <25 kg/m^2	0.73 (0.64-0.83)
BMI ≥25 kg/m^2	0.74 (0.65-0.84)
Healthy individuals	0.82 (0.70-0.95)
Unhealthy individuals	0.69 (0.61-0.77)
Non-smokers	0.77 (0.70-0.85)
Smokers	0.51 (0.39-0.65)
Non-heavy alcohol drinkers	0.71 (0.64-0.79)
Heavy alcohol drinkers	0.66 (0.54-0.81)
Excluded first 3 years of deaths	0.71 (0.65-0.78)
Excluded BMI <18.5 kg/m^2	0.70 (0.64-0.77)
Excluded abnormal ECG	0.70 (0.64-0.78)
Overall	**0.70 (0.64-0.77)**



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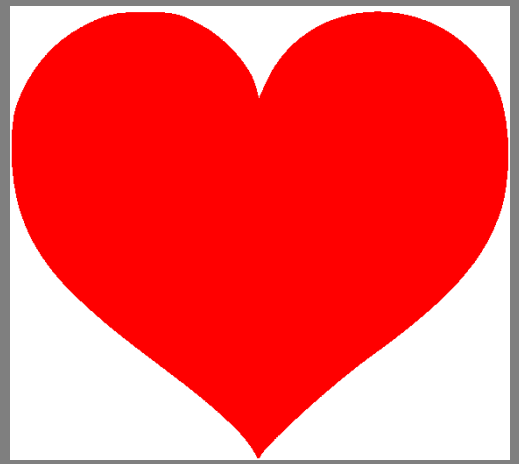

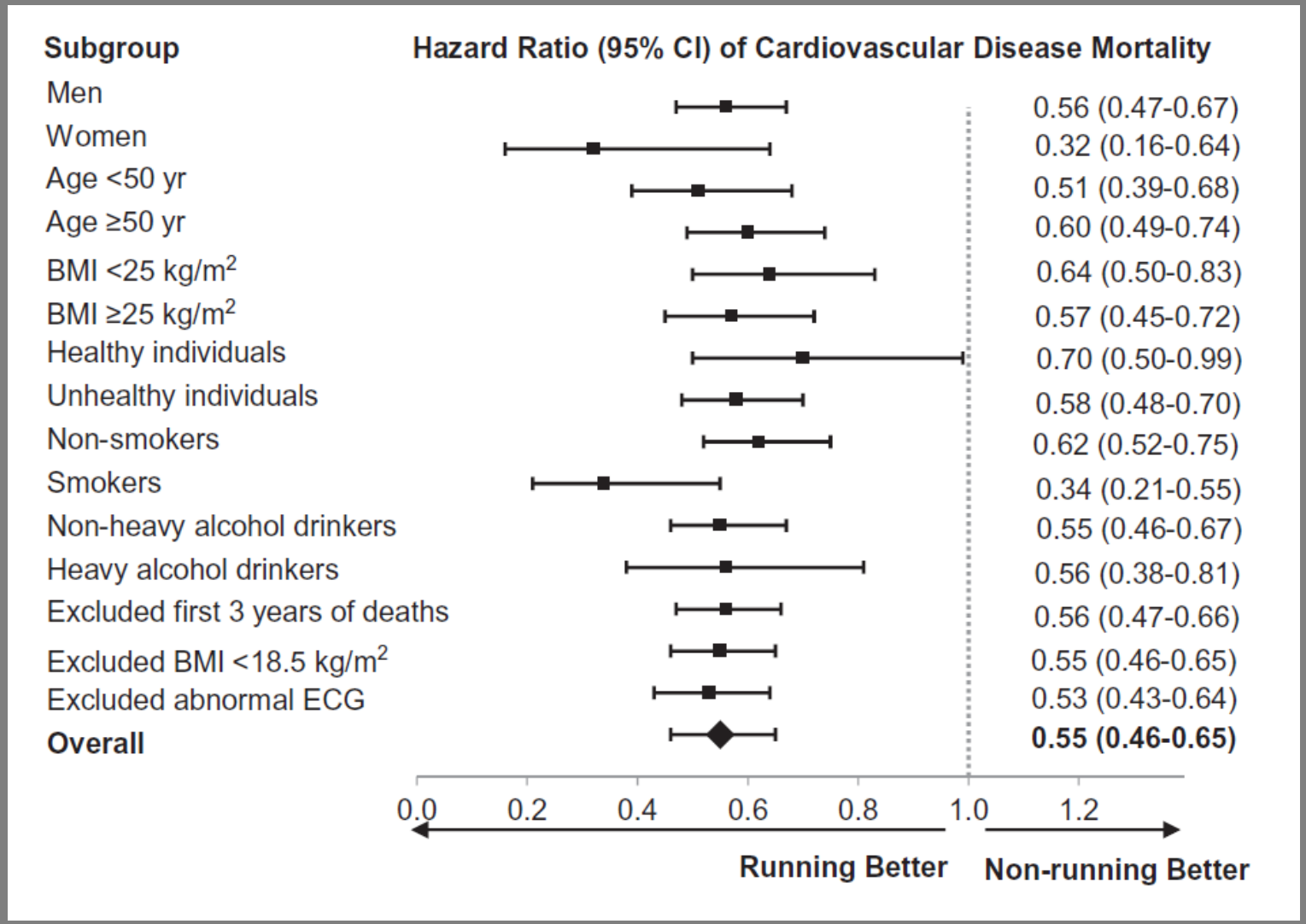

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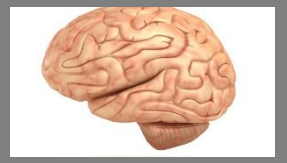
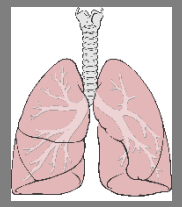
RUNNING?

1. Pain?
2. ??Musculoskeletal injury??

Prevent at least 35 chronic conditions (Booth 2012)





Manage ‘RISK’ in running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Physical Therapy in Sport xxx (2017) 1–5

Contents lists available at ScienceDirect

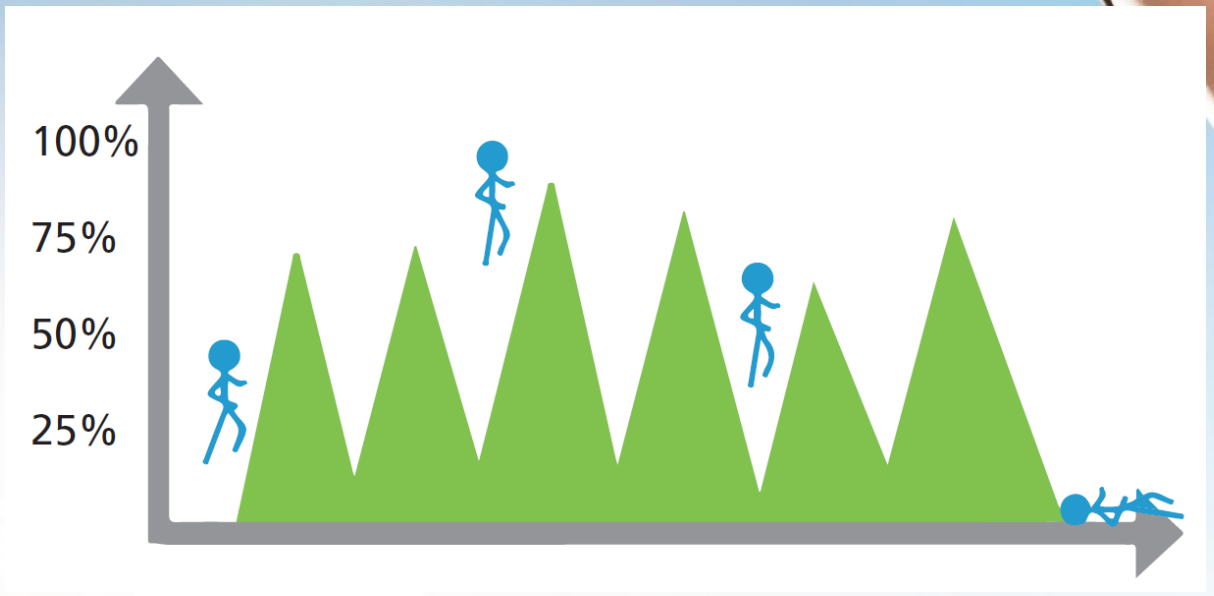
Physical Therapy in Sport

journal homepage: www.elsevier.com/ptsp

ELSEVIER

Managing RISK when treating the injured runner with running retraining, load management and exercise therapy

Principle of ‘RISK’ management	General strategies
R educe overall load	- Reduce running - Address over-stride - Increase step rate
I mprove capacity to attenuate load	- Graduated loading - Strength and Conditioning - Muscle activation cues
S hift the load Most retraining strategies Start sagittal plane	Does the individual possess capacity?
K eep adapting to the capacity and goals of the runner	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75%
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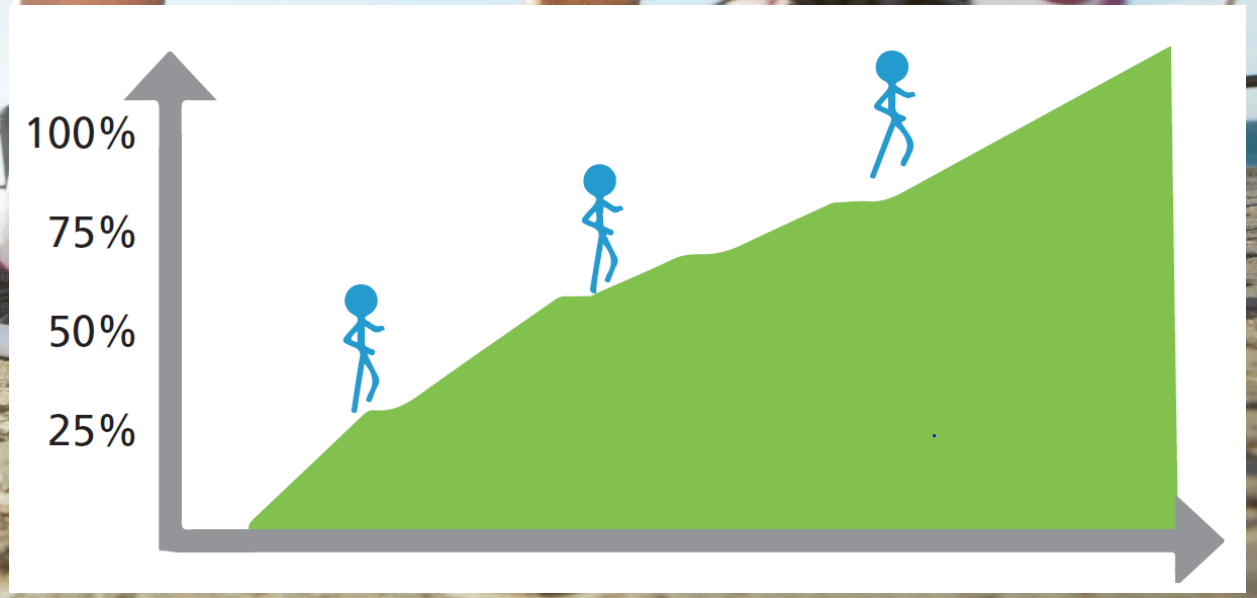
24
HOURS


100%
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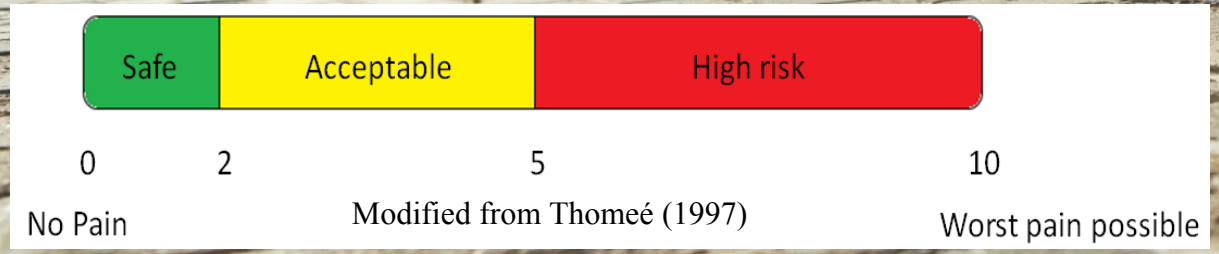
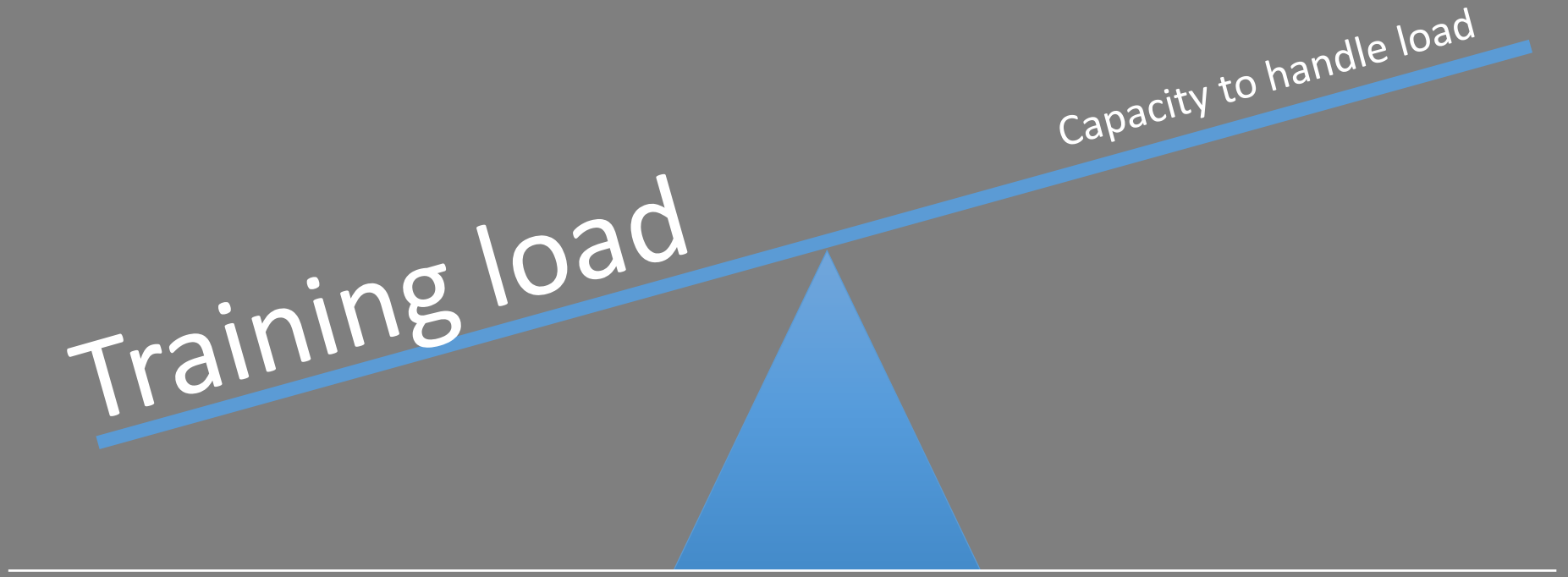
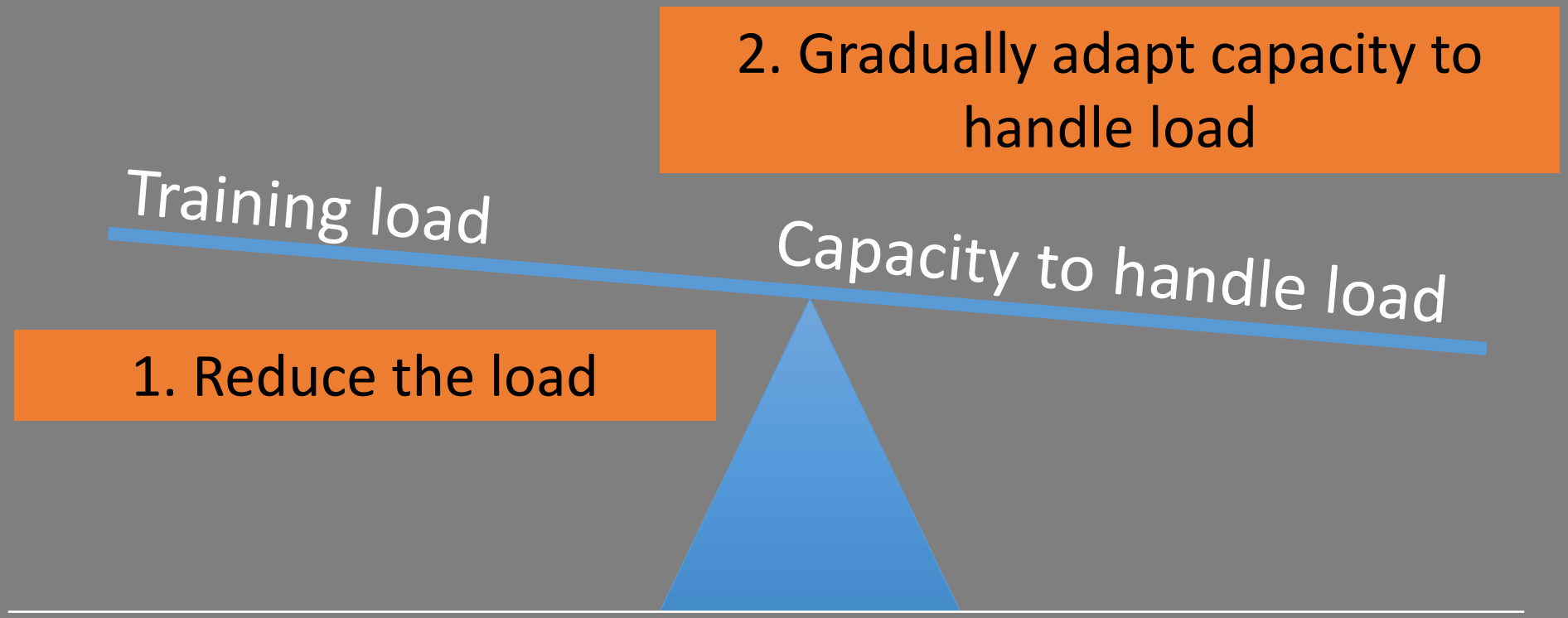

Safe
Acceptable
High risk
0
2
5
10
No Pain
Modified from Thomeé (1997)
Worst pain possible

Load management



Load management



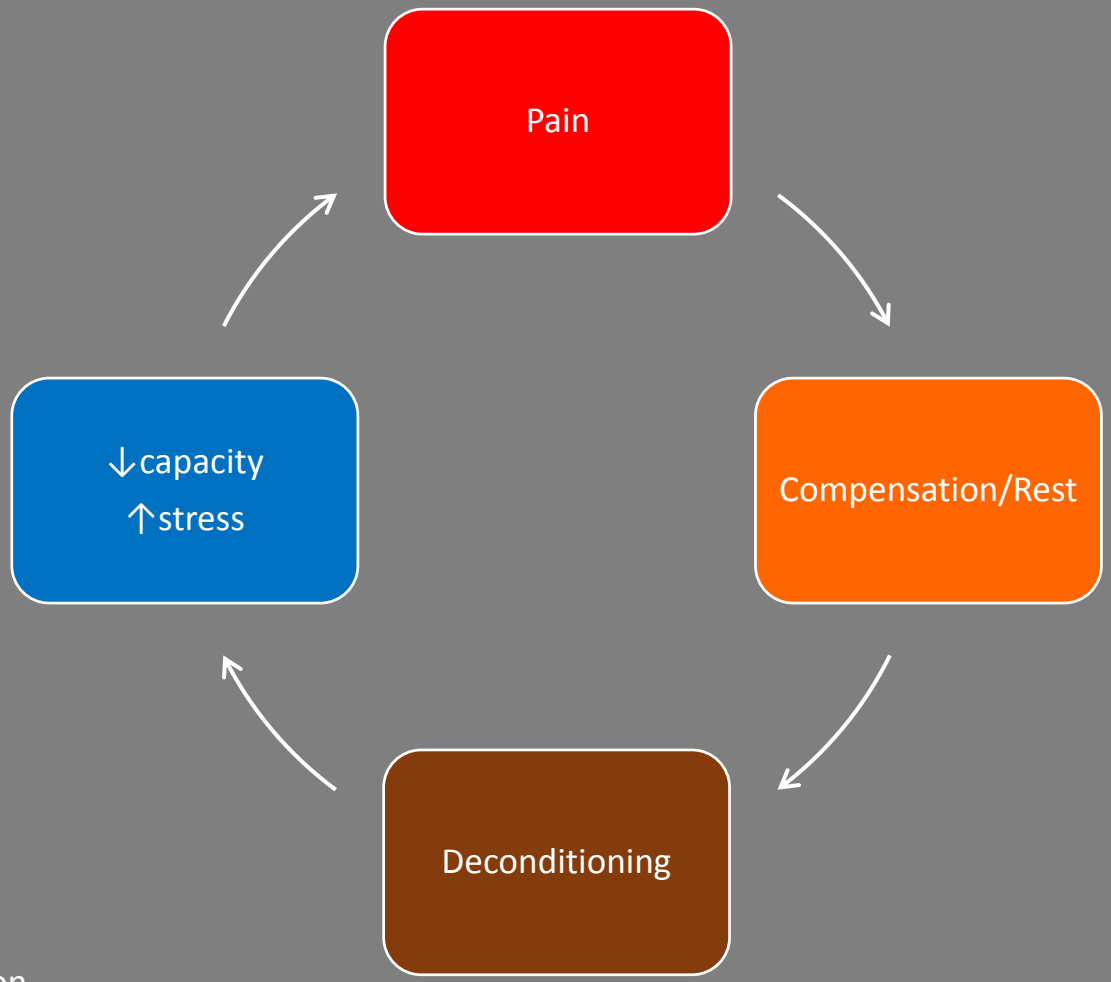
Why does it still hurt!?!

It’s not that simple!

Loading ma

Load management is vitally important

Vicious cylce



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K eep adapting to the capacity and goals of the runner	

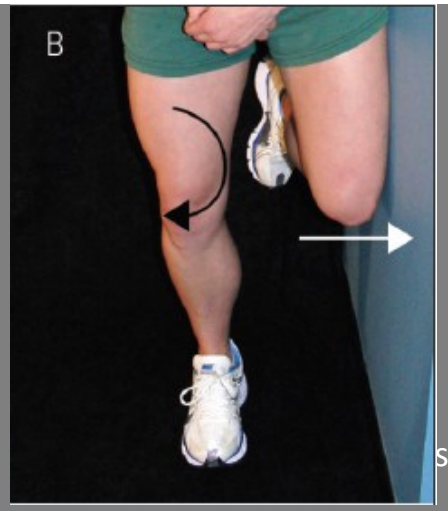
RICHARD W. WILLY, PT, PhD, OCS[1] • IRENE S. DAVIS, PT, PhD, FAPTA[2]

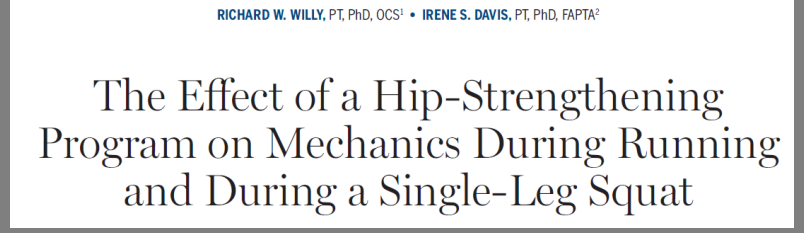
The Effect of a Hip-Strengthening Program on Mechanics During Running and During a Single-Leg Squat

TABLE 1 TRAINING PROGRAM FOCUSED ON HIP ABDUCTORS (HABD) AND HIP EXTERNAL ROTATORS (HER)*

Week of Study	Exercise 1*	Exercise 2*
Week 1	Sidelying hip HER/extension, 2 × 10, 5 s	HABD straight leg raise against wall, 2 × 10, 5 s
Week 2	Resistance band clamshell (HER), 2 × 10	HABD straight leg raise against wall, 2 × 10, 10 s
Week 3	Bilateral squat with resistance band targeting HER, 2 × 10, 5 s	Contralateral pelvic hike (HABD) against wall, 2 × 10 reps, 5 s
Week 4	Sidestepping with resistance band (HABD), 2 × 10 bilateral	Single-leg squat with hand support, 2 × 10
Week 5	Standing isometric HABD, HER, pelvic hike against wall, 2 × 10, 5 s	Single-leg squat without hand support, 2 × 10
Week 6	Standing isometric HABD, HER, pelvic hike against wall, 2 × 10, 10 s	Single-leg squat with resistance band targeting HABD, 2 × 10

**Values after each exercise are number of sets by number of repetitions, duration of hold.*



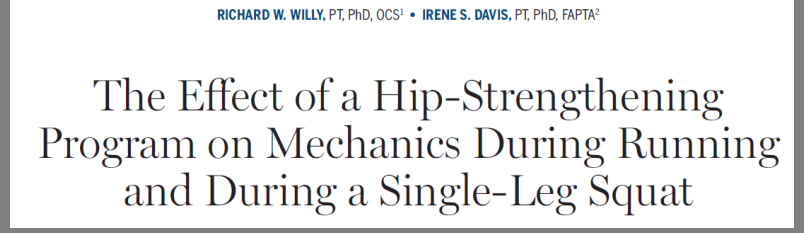


Changes in mechanics are task specific

Increased hip strength

- Abduction = 42%
- ER = 24%

Angle	SLSq pre	SLSq post
Hip add	10.6	3.9
Hip IR	9.8	4.4
Pelvic drop	-0.8	-4.6



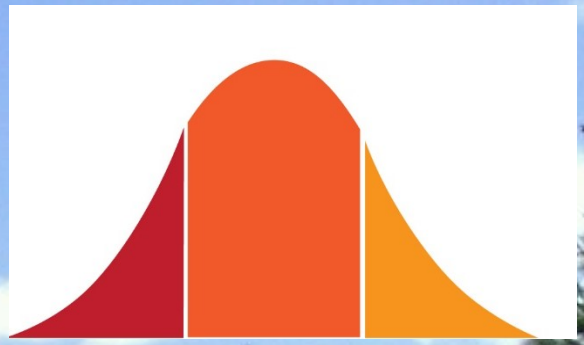
Changes in mechanics are task specific

Increased hip strength

- Abduction = 42%
- ER = 24%

Angle	SLSq pre	SLSq post	Run pre	Run post
Hip add	10.6	3.9	20.7	20.0
Hip IR	9.8	4.4	10.5	8.3
Pelvic drop	-0.8	-4.6	9.9	10.0

What is running retraining?



1. Identifying any theoretical (abnormal) running mechanics which may be contributing to tissue overload

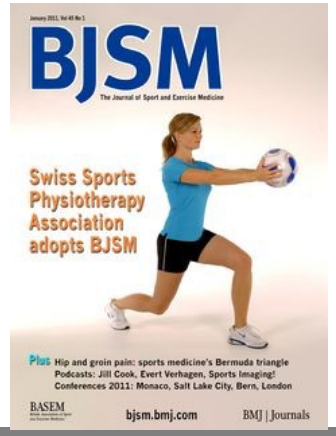
2. Establish if running mechanics can be altered

3. Facilitate the desired running mechanics changes and encouraging motor learning to ensure maintenance of any change

CHANGE THE PATH OF LEAST RESISTANCE

Is Running Retraining evidence based?

Review



Running retraining to treat lower limb injuries: a mixed-methods study of current evidence synthesised with expert opinion

C J Barton,[1,2,3,4] D R Bonanno,[1,5] J Carr,[2,6] B S Neal,[3,4] P Malliaras,[1,2,4] A Franklyn-Miller,[7,8] H B Menz[1,5]

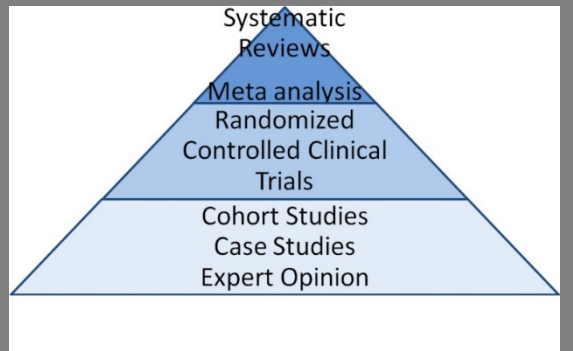
Can we guide practice? - Mixed methods design

Quantitative

- Summarise clinical and biomechanical findings related to running retraining interventions

Qualitative

- Semi-structured interviews with international experts
- Explore clinical reasoning for the use of running retraining in clinical practice



@DrChrisBarton

Results

<u>Quantitative</u>

4 case series studies

46 biomechanical studies

Mostly asymptomatic

<u>Qualitative</u>

16 experts interviewed

12 hours of transcripts

10 sections, 29 themes, 75 sub-themes

Guidance from biomechanical literature

- 19 studies on step rate manipulation
- 15 studies on strike pattern
- 4 studies on step width
- 3 studies on other proximal running cues
- 3 studies on cues to reduce impact loading
- Clear that modifying running technique effects biomechanics

Guidance from biomechanical literature

- 19 studies on step rate manipulation
- 15 studies on strike pattern
- 4 studies on step width
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Is Running Retraining evidence based?

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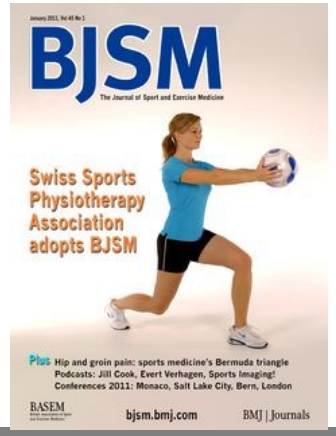

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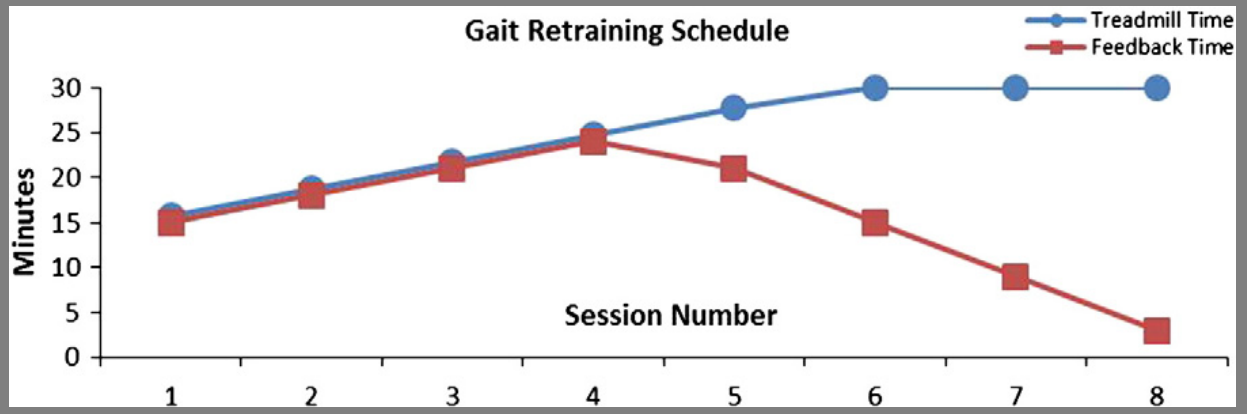
"Our synthesis of published evidence related to clinical outcomes and biomechanical effects with expert opinion indicates running retraining warrants consideration in the treatment of lower limb injuries in clinical practice"

Methodolgy



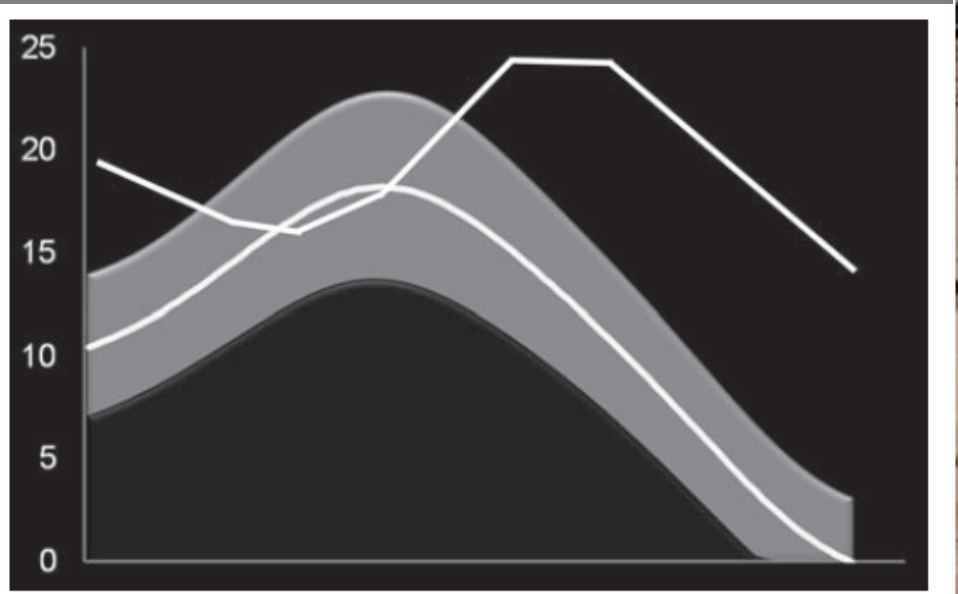
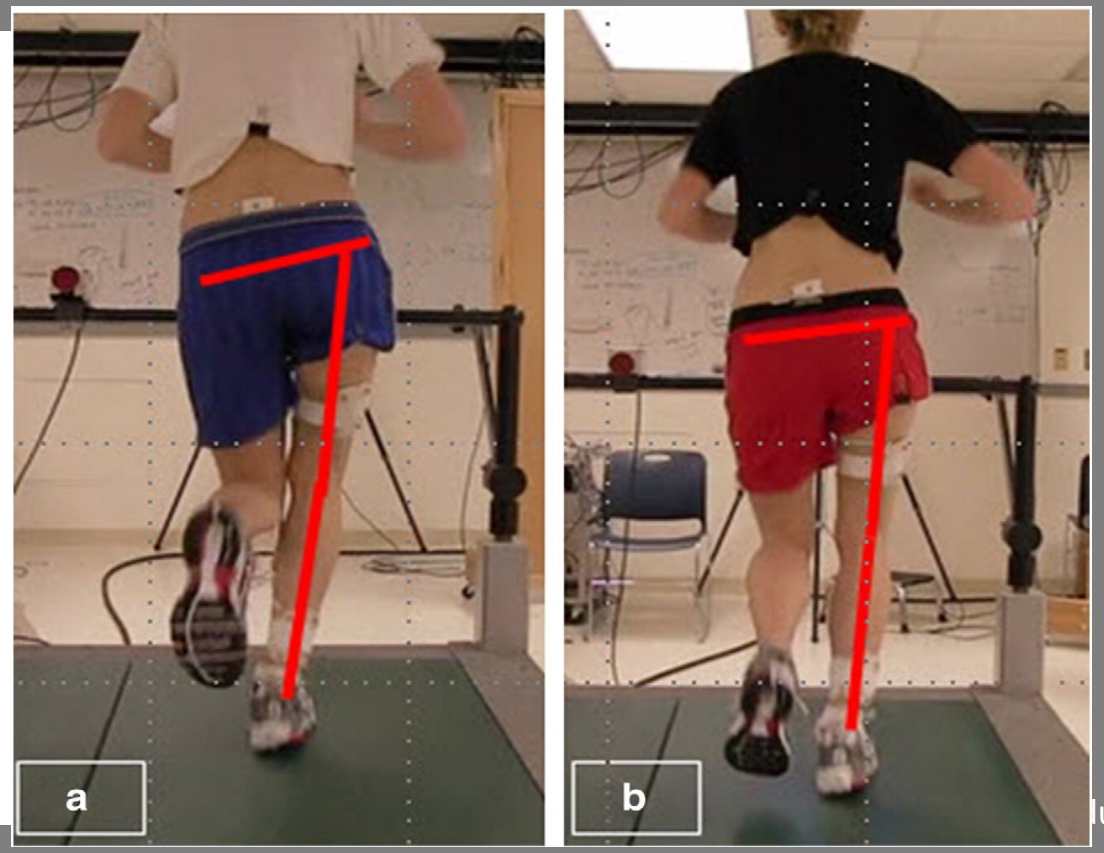
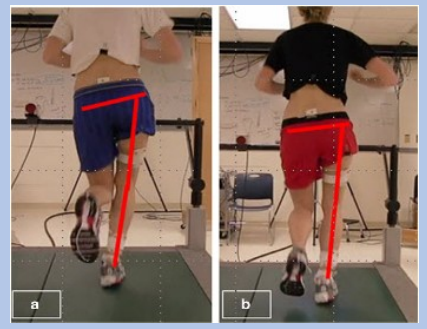
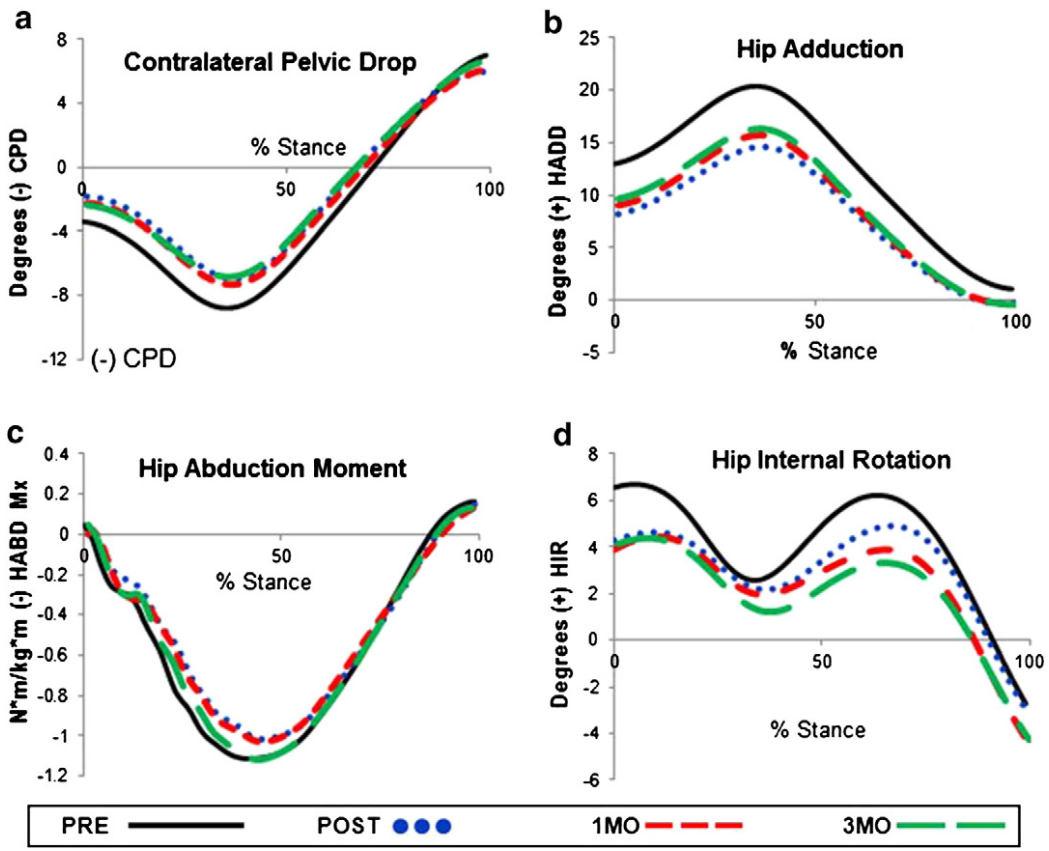


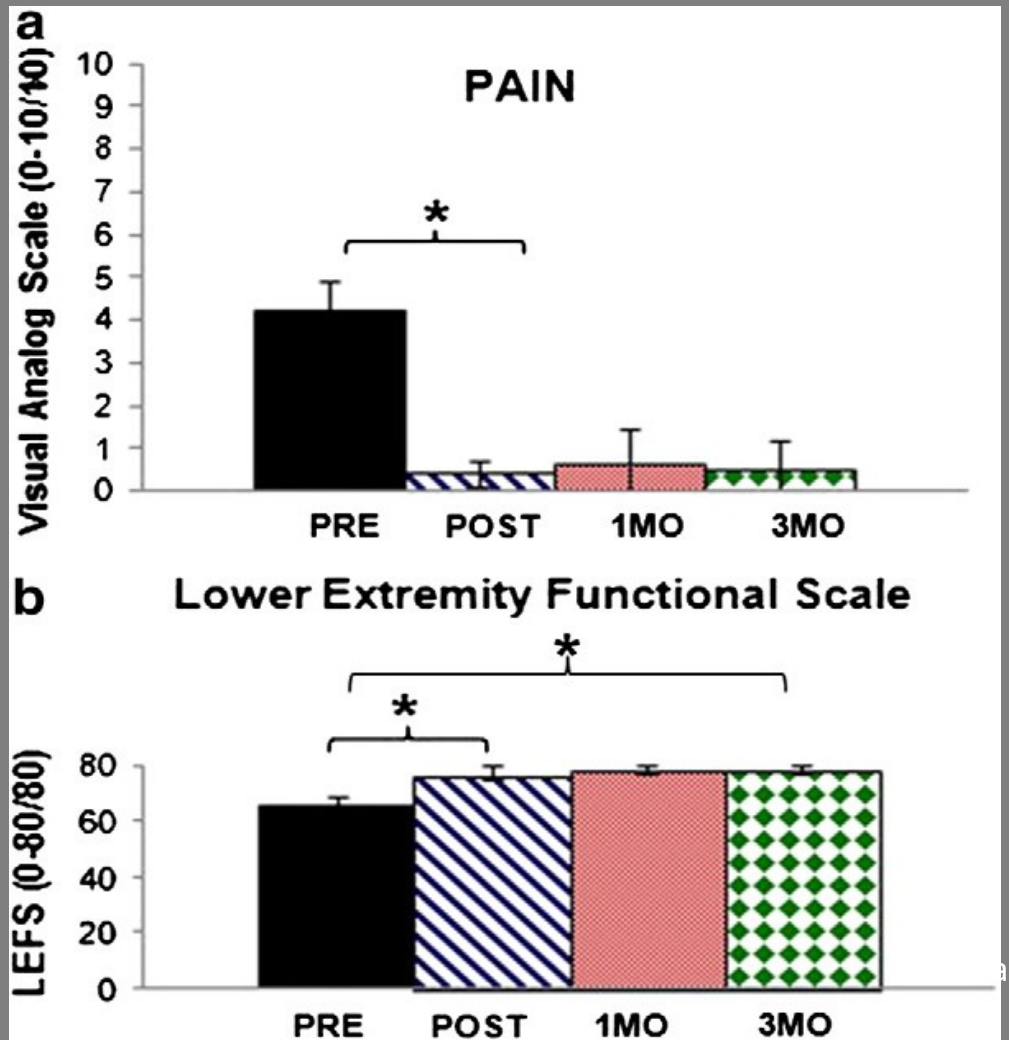
Figure 1 Screen images seen by subjects undergoing real-time gait retraining. The grey region represents the mean (±1 SD) of a previously collected normal group. The subject was instructed to lower their curve to match the shaded region.



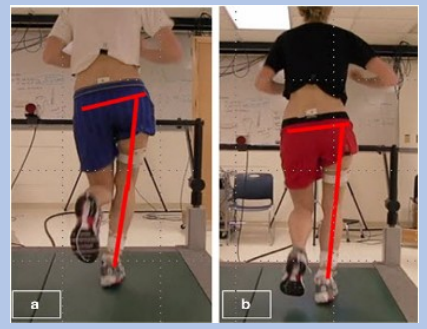
Patellofemoral Pain – Limited Evidence (Noehren 2011; Willy 2012)

Evidence	Biomechanics
Intervention 8 sessions (2 weeks) Visual and verbal feedback to reduce hip adduction **Outcome** Reduce pain and improve function 	

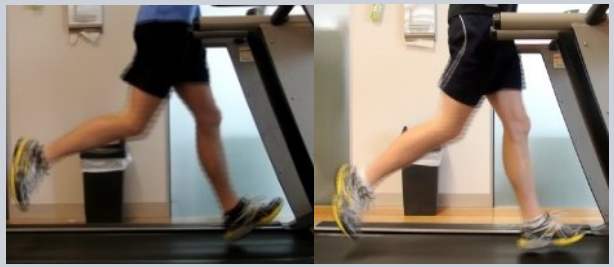
In clinical practice?



Patellofemoral Pain – Limited Evidence (Noehren 2011; Willy 2012)

Evidence	Qualitative findings
Intervention 8 sessions (2 weeks) Visual and verbal feedback to reduce hip adduction **Outcome** Reduce pain and improve function 	**Strongly advocated** **Consider step rate, hip adduction/internal rotation, trunk and pelvic position** *"Most common thing with patellofemoral would be overstriding and also medial collapse, particularly the females" (2)* *"Patellofemoral pain, often there is a sort of femoral adduction environment to it ….. If it's a gait issue where there's no weakness underlying it, then I'd go for the gait retraining" (5)* *"With patellofemoral, again we found that by changing those sagittal plane kinematics, we noticed a change in frontal plane kinematics as well" (9)*

Exertional Lower Leg Pain - Limited Evidence (Diebal 2012; Breen 2015)

Evidence	Biomechanics
Intervention 6 weeks Transition from RFS to FFS/MFS 	

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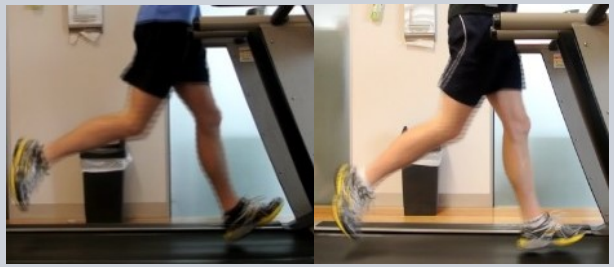
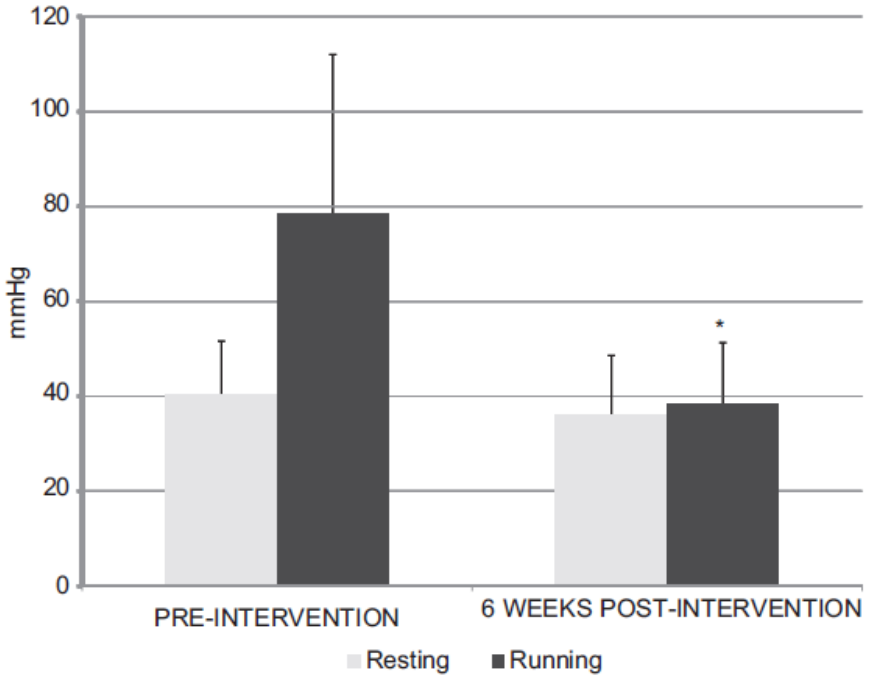
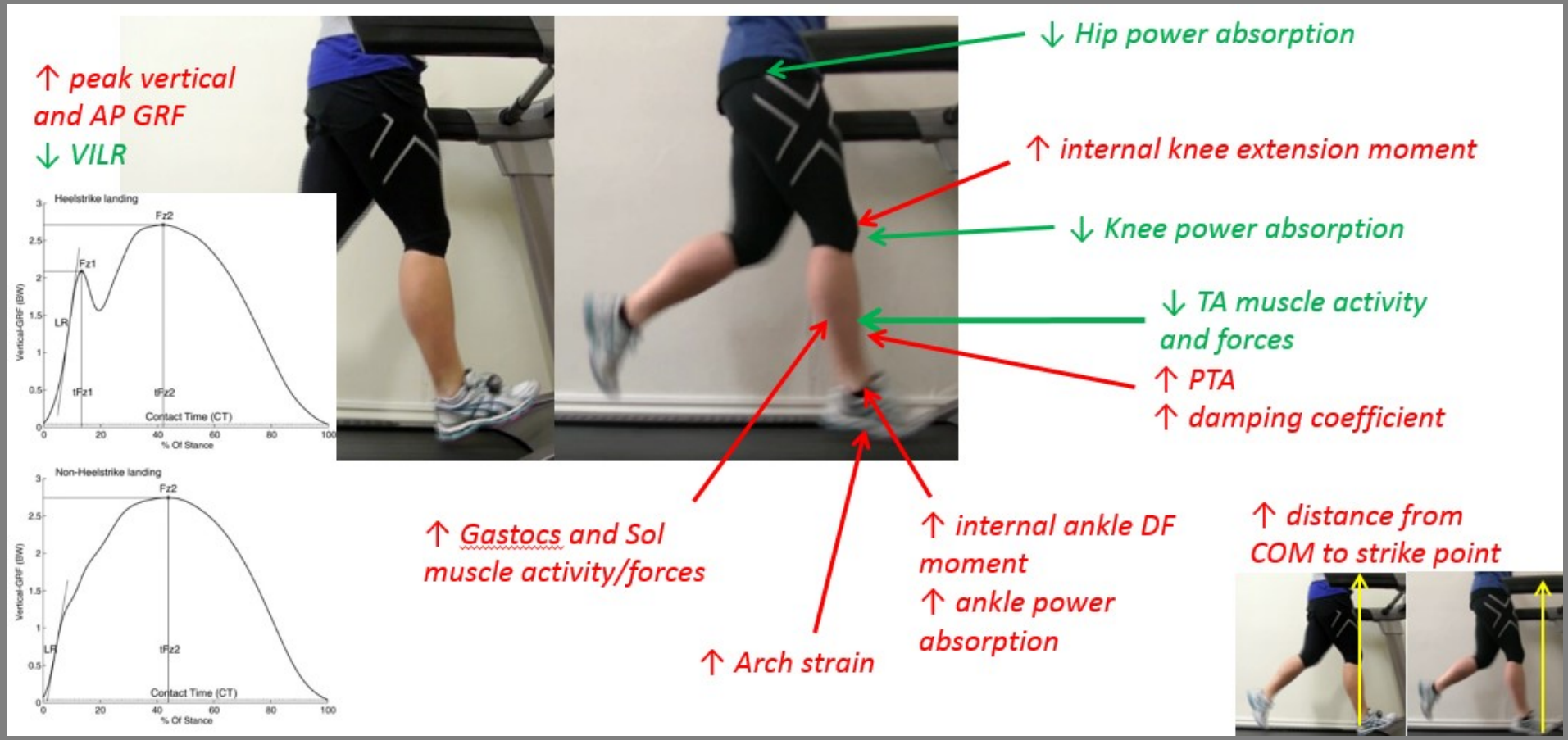
Intervention 6 weeks Transition from RFS to FFS/MFS **Outcome** Reduced pain and improve function 	

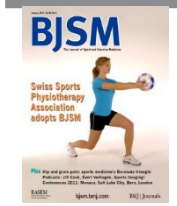
Exertional lower leg pain – 3 minutes

8 weeks – 30 minutes pain free

Transition from rearfoot to forefoot strike



Increase step rate



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TREK TRANSLATING RESEARCH EVIDENCE AND KNOWLEDGE

↓ *gluteal muscle forces during stance*

↓ hip energy absorption and peak internal hip extension moment
↓ *peak hip internal abduction and external rotation moment*

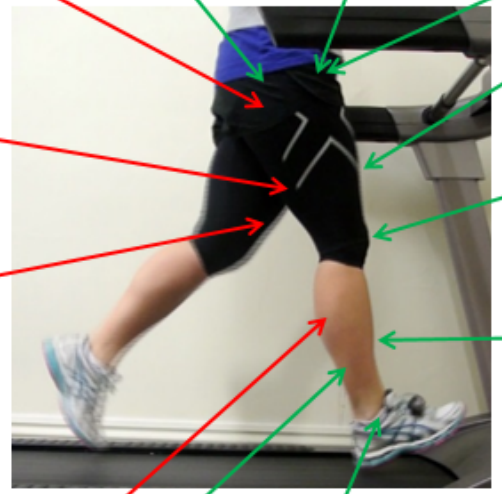
↓ *peak hip adduction*

↑ gluteal muscle activity and forces during late swing

↓ quadriceps forces during stance

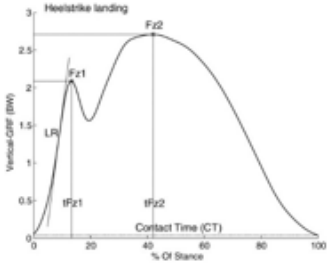
↑ hamstring muscle activity and forces during late swing

↓ PFJ stress/forces
↓peak knee flexion
↓ knee energy absorption and internal knee extension moment
↓ peak patellar tendon forces



↑ rectus femoris muscle activity and forces during late stance and swing

↓ PTA
↓ *tibial contact forces*
↓ TA activity (late swing)



↑ gastrocnemius muscle activity during late swing

↓ DF and foot strike and midstance
↓ peak internal DF moment

↓ vertical GRF
↓ *VIP, VALR, VILR*
↓ AP GRF
↓ rearfoot and forefoot plantar pressures

↓ soleus muscle forces during stance

Manage ‘RISK’ in running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K eep adapting to the capacity and goals of the runner	

Painful anterior CECS

Previously failed physio

Overstride

Heavy heel strike

Considering surgery

4 weeks later

Strength program

No manual therapy

Increased cadence

Pain-free running

Reduce loading (impact)

Review

Running retraining to treat lower limb injuries: a mixed-methods study of current evidence synthesised with expert opinion

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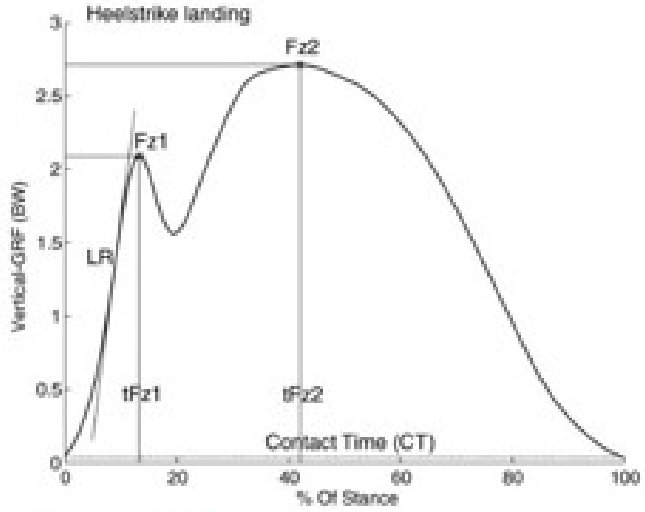
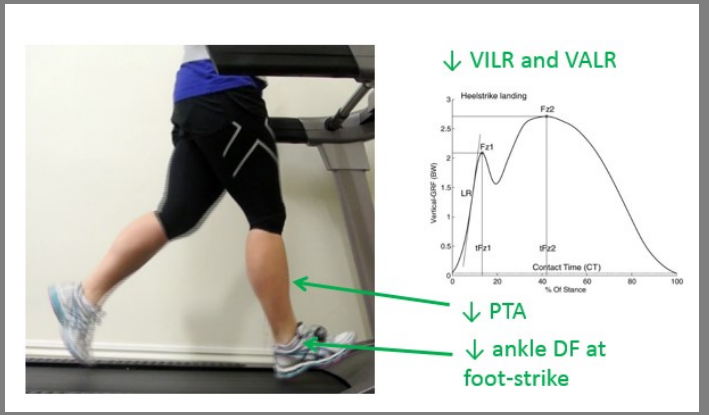
↓ VILR and VALR



↓ PTA

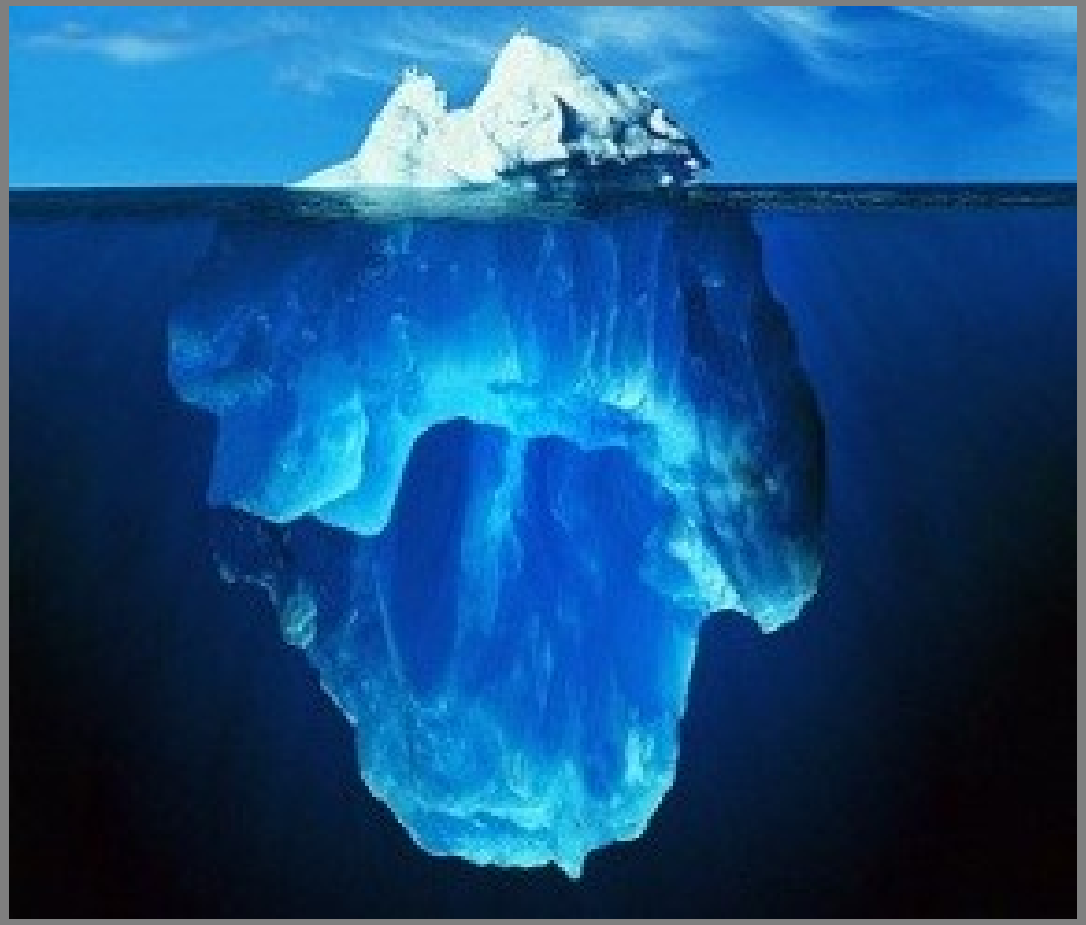
↓ ankle DF at foot-strike

Reduce loading (impact)



- This approach can be helpful for <u>some runners</u>
- Runner will pick their 'path of least resistance' which may or may not be helpful
- Don't reduce cadence or create a crouched runner
- Consider barriers of why someone cannot run soft (likely muscle strength/power deficits)

Highly researched ≠ gold standard



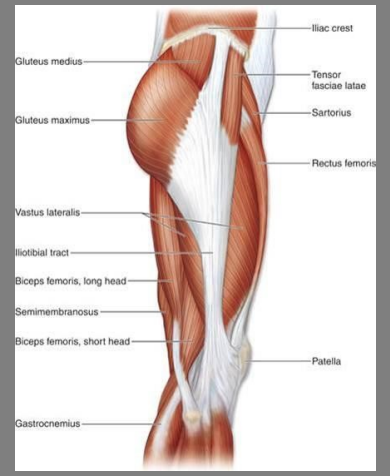
You need to be adaptable to each runner

External cue: The athlete focuses on affecting something in their environment (outcome focussed)

External cues typically associated with better performance outcomes + easier to achieve

Internal cue: The athlete focuses on their body parts and how they move (internal focussed)

Internal cues will lead to change being made as intended (specificity)

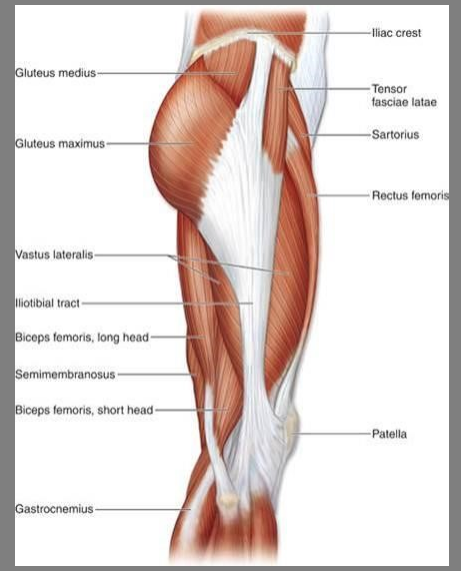


Understand biomechanics

Three categories:

- Kinematics (motion we can see and assess)
- Kinetics (forces which drive the motion) - INJURY
- Neuromuscular/EMG function (control of kinematics and kinetics)

Is the issue kinematics or neuromotor?



Kinematic or kinetic problem?

Kinematic or kinetic problem?

Kinematic or kinetic problem?

Kinematic or kinetic problem?

Kinematics ≠ kinetics

- The movement we see does not necessarily reflect stresses placed on joints

- Injury is the result of forces or kinetics (not kinematics)

Joint and tissue forces dictated by:

1. Load (speed, landing point)
2. Joint position and motion
3. External factors (surface, footwear)
4. Intrinsic attenuation (muscle function)

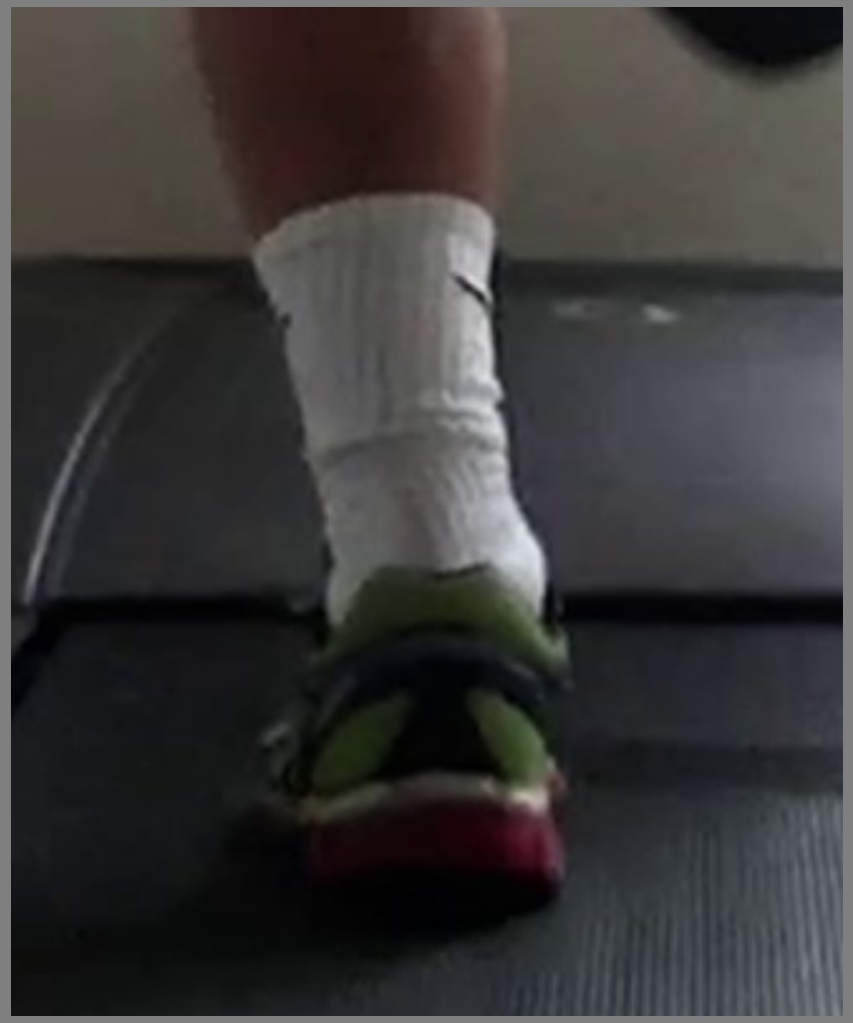
Exertional lower leg pain

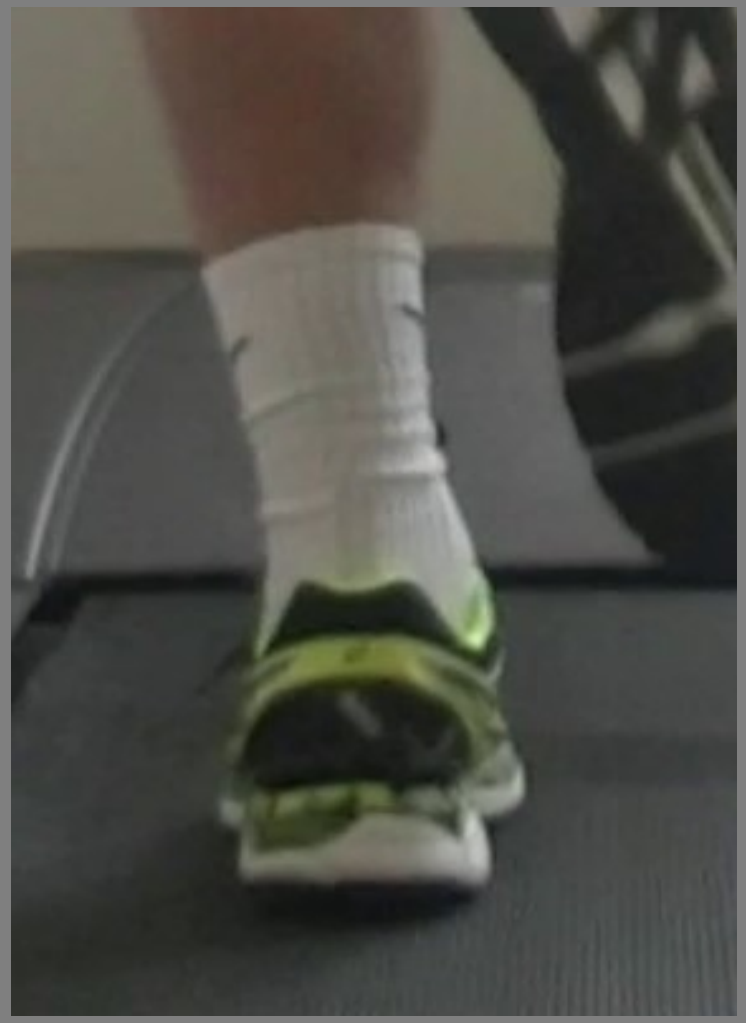
.au

Increased step rate

Proximal cues – pain free at 1 month

What about the foot?

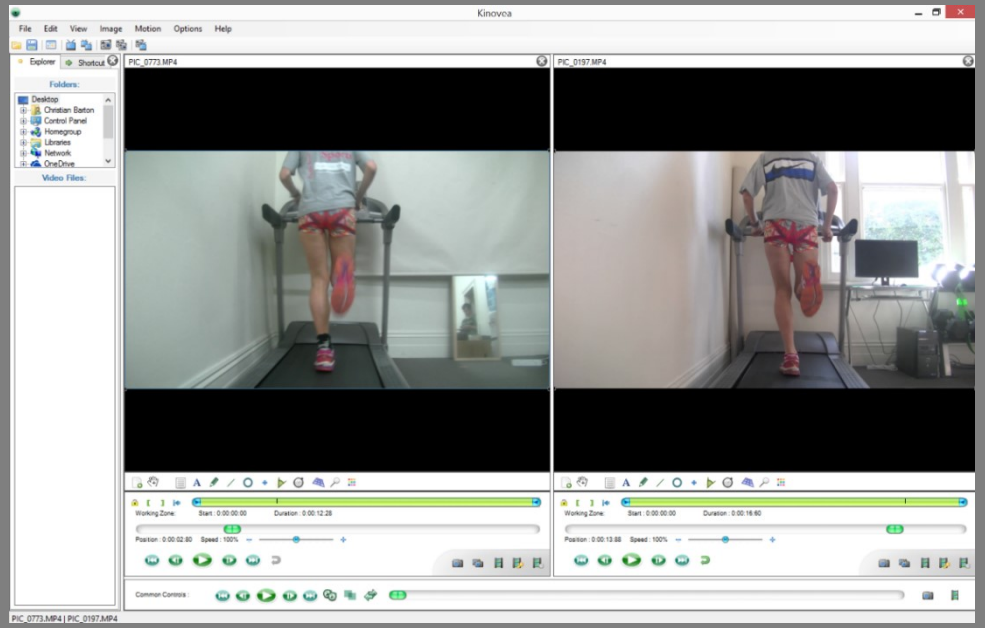




It will cost you nothing to assess running

PC - Kinovea

MAC and Smart Phone - hudl



Treadmill or overground assessment

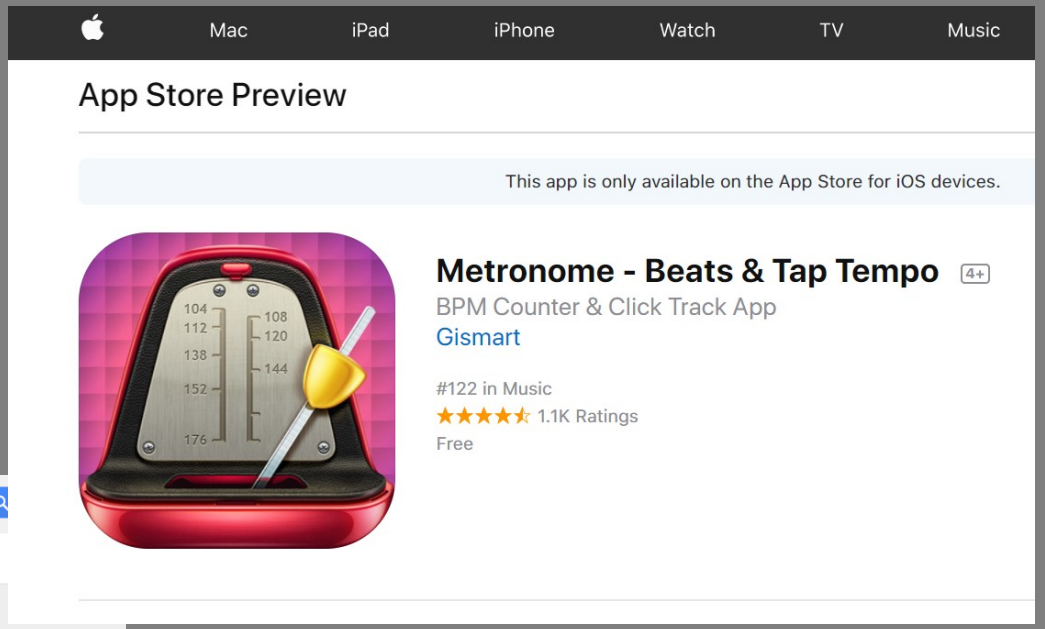
- Shortened stride and increased cadence (Riley 2008; Elliot 1976; Schache 2001)
- Reduced peak and range of knee flexion (Riley 2008; Nigg 1997)
- Some runners switch to FFS (Kluitenberg 2012)
- Similar vertical GRF (Kluitenberg 2012)
- COM moves posterior rather than anterior
- Treadmill not suitable > 15 km/h

Considerations

1. Structure
2. Soft tissue flexibility
3. Available joint range of motion
4. Neuromotor function
5. Muscle strength + power
6. Muscle endurance

Employ other active management strategies

Step Rate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Music
App Store Preview
This app is only available on the App Store for iOS devices.
Metronome - Beats & Tap Tempo
4+
BPM Counter & Click Track App
Gismart
#122 in Music
1.1K Ratings
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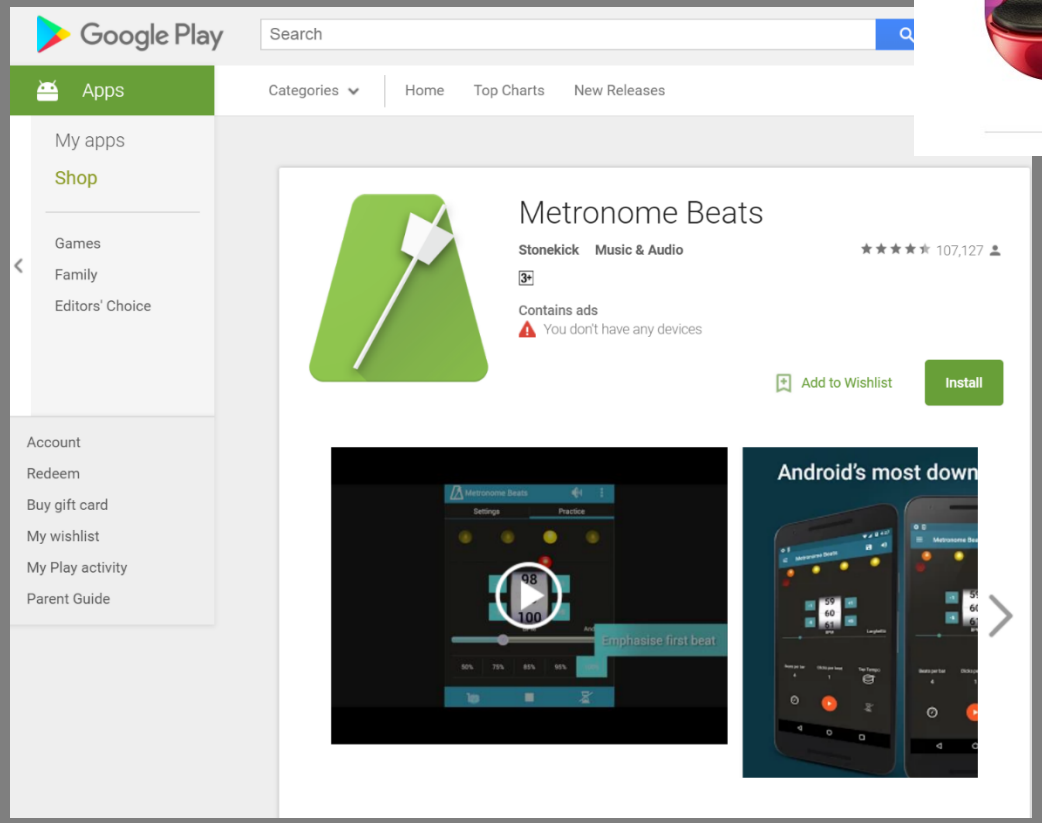
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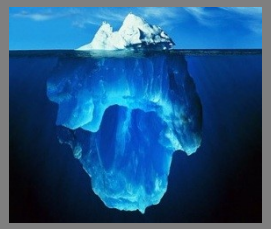
My Play activity
Parent Guide
Metronome Beats
Stonekick
Music & Audio
107,127
Contains ads
You don't have any devices
Add to Wishlist
Install
Emphasise first beat
Android's most down

This all matters little if we don't get load management right



Take Home

1. Running retraining ca
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Manage 'RISK' in running

We need to embrace running assessment and retraining as a profession!

@DrChrisBarton

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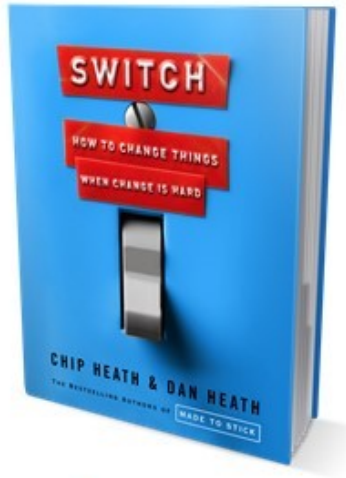
JOIN THE **FREE** EXERCISE COURSE



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TRANSLATING RESEARCH EVIDENCE AND KNOWLEDGE

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Group: http://bit.ly/trekexfree

1. **Motivate the elephant**

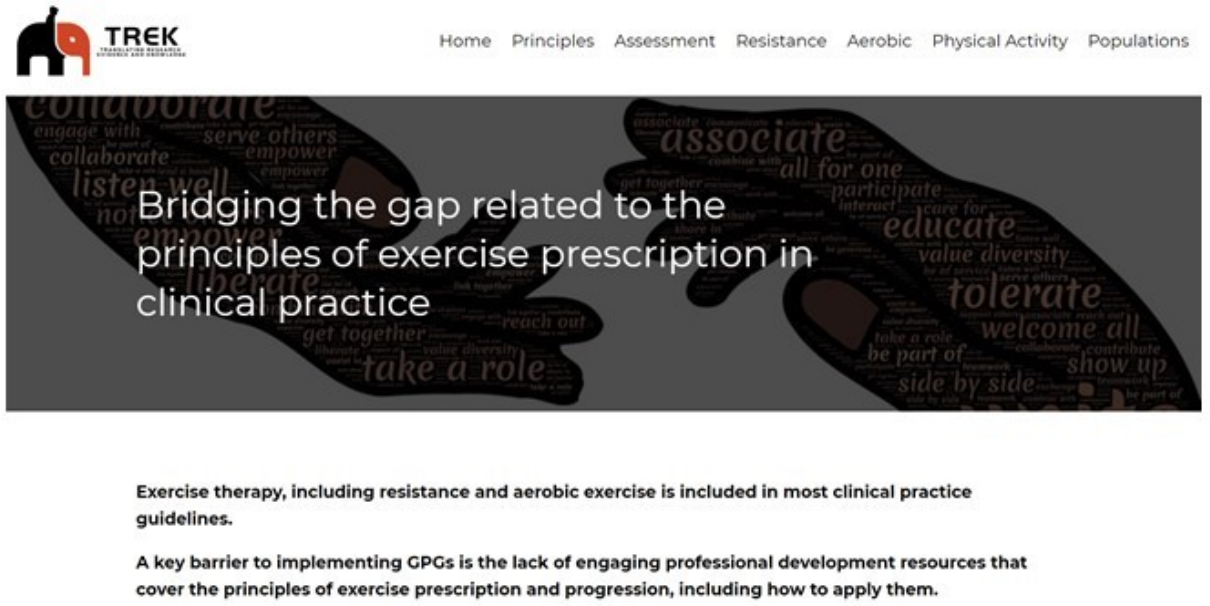
(desire to bridge knowledge gaps)

2. **Direct the rider**

(awareness of knowledge gaps)

3. **Shape the path**

(optimise engagement with KT resources)



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Questions?

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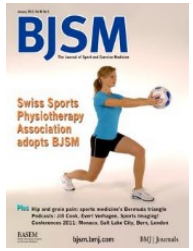
Review



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Managing RISK when treating the injured runner with running retraining, load management and exercise therapy

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