Running retraining to treat lower limb injuries

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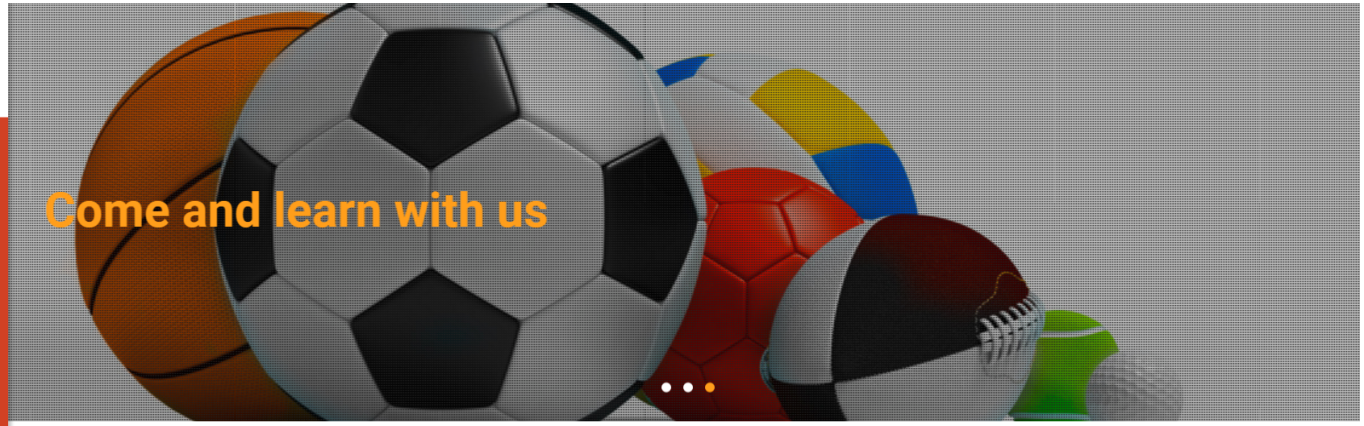

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Important: This site should never replace real world consultation. If you have an injury or health condition you should seek appropriate assessment, advice and treatment from a qualified health professional.

10 things not to do if you have lower limb tendon pain

By Professor Jill Cook. Rest completely The old adage of use it or lose it

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First time presenting @apaphysio and session has already sold out. Looking forward to it @SymmetryPhysio

4:27 PM

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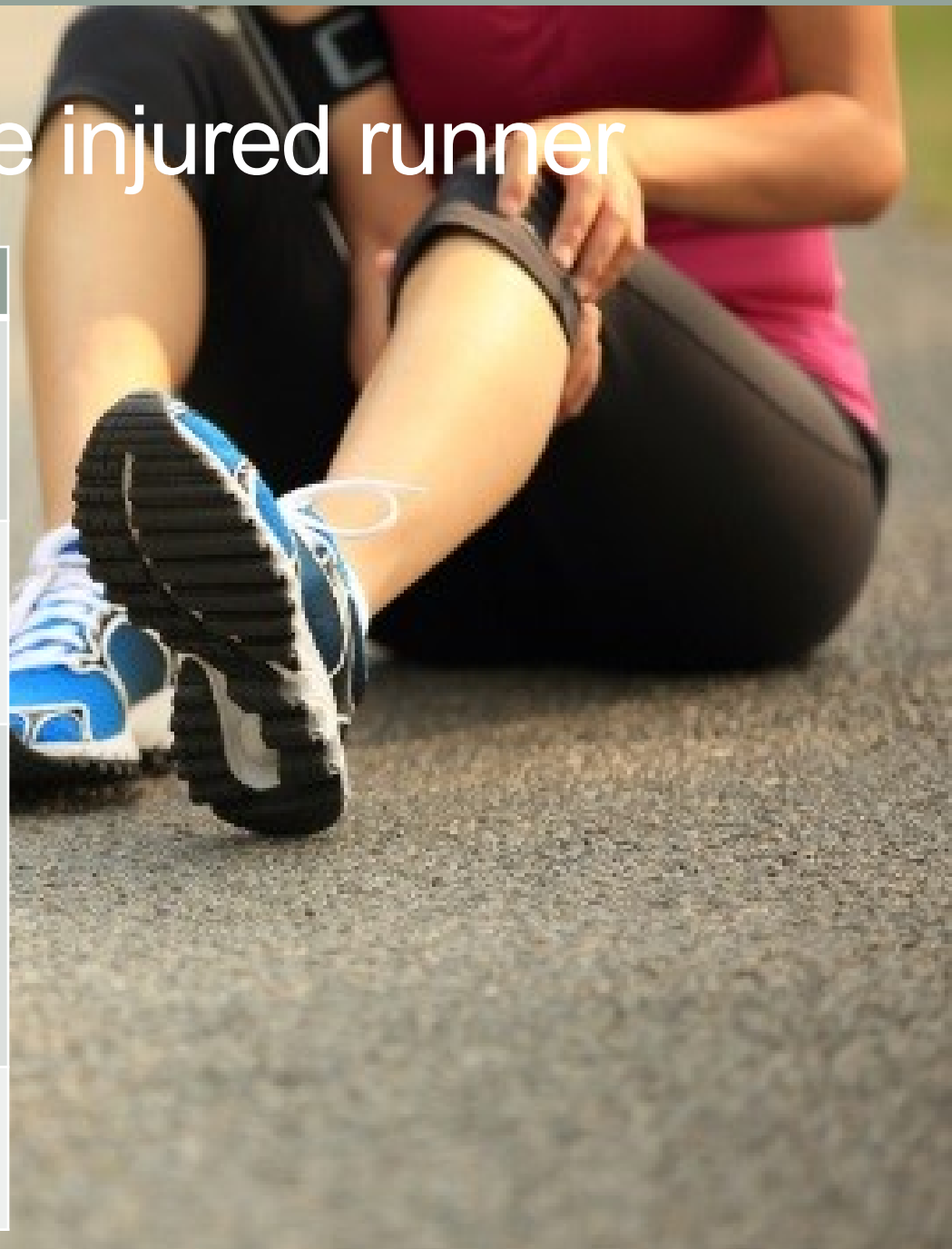
Manage ‘RISK’ in the injured runner

Principle of ‘RISK’ management
Reduce overall load
Improve capacity to attenuate load
Shift the load
Keep adapting to the capacity and goals of the runner



I want to inspire you!

1. **Assessing running technique is important**

2. **Running technique is changeable**

3. **Changing technique can reduce pain**

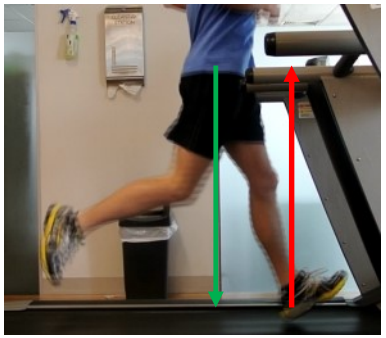
Common biomechanics linked to injury

<u>Proximal</u>

- Pelvic and trunk control
- Hip control
- Knee valgus
- Knee flexion

<u>Distal</u>

- Foot mechanics
- Foot strike pattern
- Over-striding
- Ankle dorsiflexion



What is running retraining?

1. Identifying theoretical (abnormal) mechanics contributing to tissue overload

2. Establish potential for change

3. Facilitate the desired changes

CHANGE THE PATH OF LEAST RESISTANCE

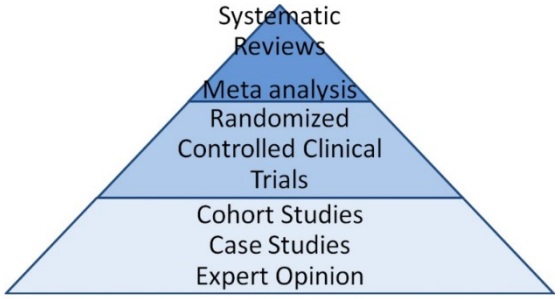
Can we guide practice? - Mixed methods design

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



Special Thanks

Co-researchers

Daniel Bonanno, Jeremy Carr, Brad Neal, Peter Malliaras, Andy Franklyn-Miller, Hylton Menz

16 Interviewed participants

The Search (June 2015)

Studies which evaluated “the implementation of any cue or strategy to alter an individuals running technique”

1. Changes to pain or function

2. Changes to running biomechanics

- Kinematics
- Kinetics
- Neuromotor

Defining levels of evidence

Downs and Black quality index

Strong evidence = *Consistent findings amongst multiple studies, including at least 3 high quality*

Moderate evidence = *Consistent findings amongst multiple studies, including at least 3 high/moderate or 2 high quality*

Limited = *Consistent findings amongst multiple low/moderate quality studies, or 1 high quality*

Very limited = *Findings from 1 low/moderate quality study*

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

Indications for running retraining

- Clearly not limited to two conditions
- Chronic and recurrent injuries
- Clear link between individuals running biomechanics and injury

Findings	Illustrative quotes
Injuries likely to benefit from running retraining	*"It's probably all overuse injuries actually." (6)* *"Anything really lower limb related." (7)* *"I think, really, you can almost say that as a role for gait retraining and virtually any running related pathology." (12)* *Any kind of abnormal gait pattern that we believe have as a biomechanical association with their problem." (4)* *"I think it works with any conditions where there is a significant motor pattern issue that is not related to an unchangeable, underlying biomechanical problem." (5)*

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

Evidence	Biomechanics

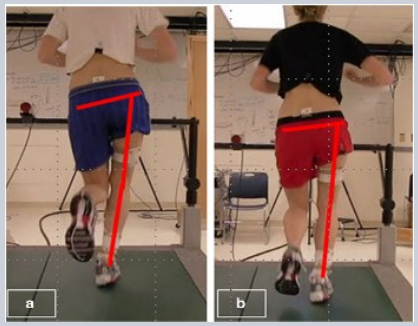
Intervention

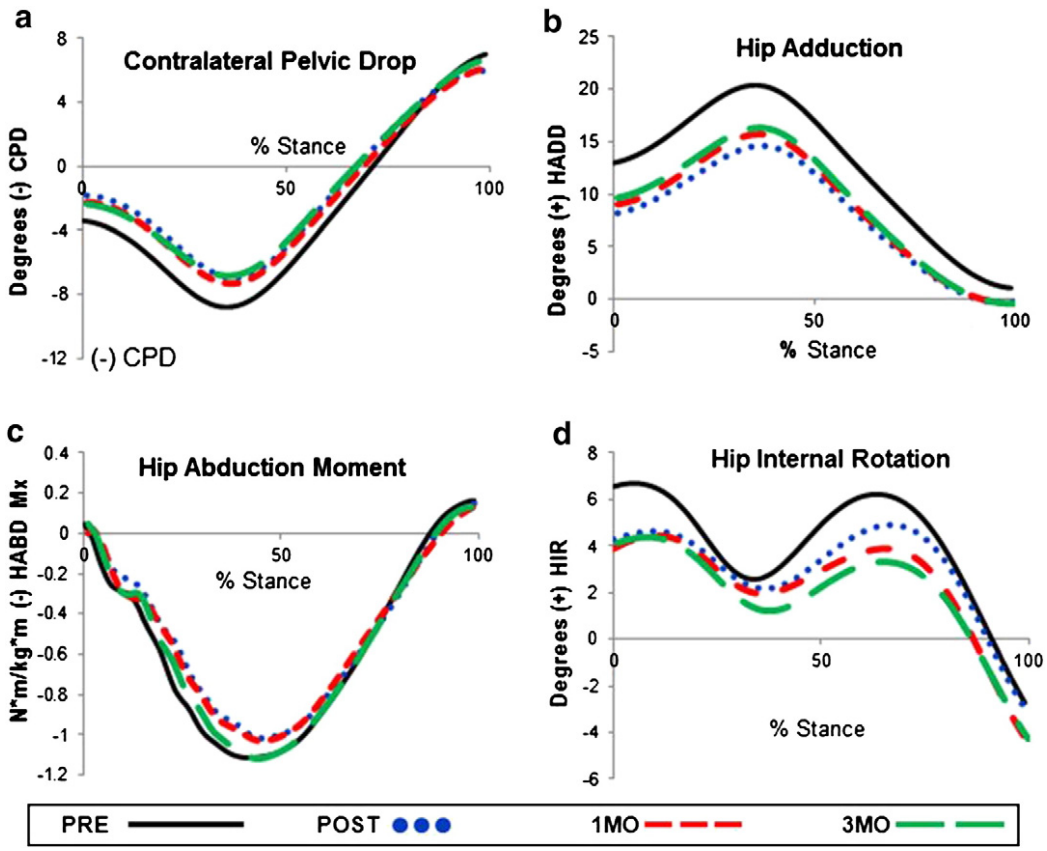
8 sessions (2 weeks)

Visual and verbal feedback to reduce hip adduction

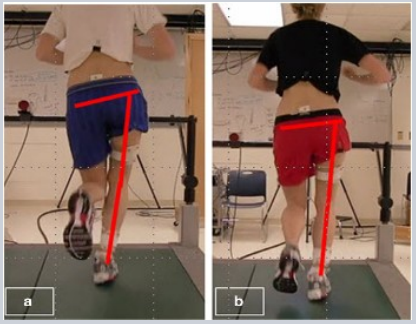
Outcome

Reduce pain and improve function





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)*

[CASE REPORT]

ROY T.H. CHEUNG, PT, PhD[1] • IRENE S. DAVIS, PT, PhD[2]

Landing Pattern Modification to Improve Patellofemoral Pain in Runners: A Case Series

FIGURE 1. Audio biofeedback device and force transducer affixed to the rearfoot area of the shoe insole.

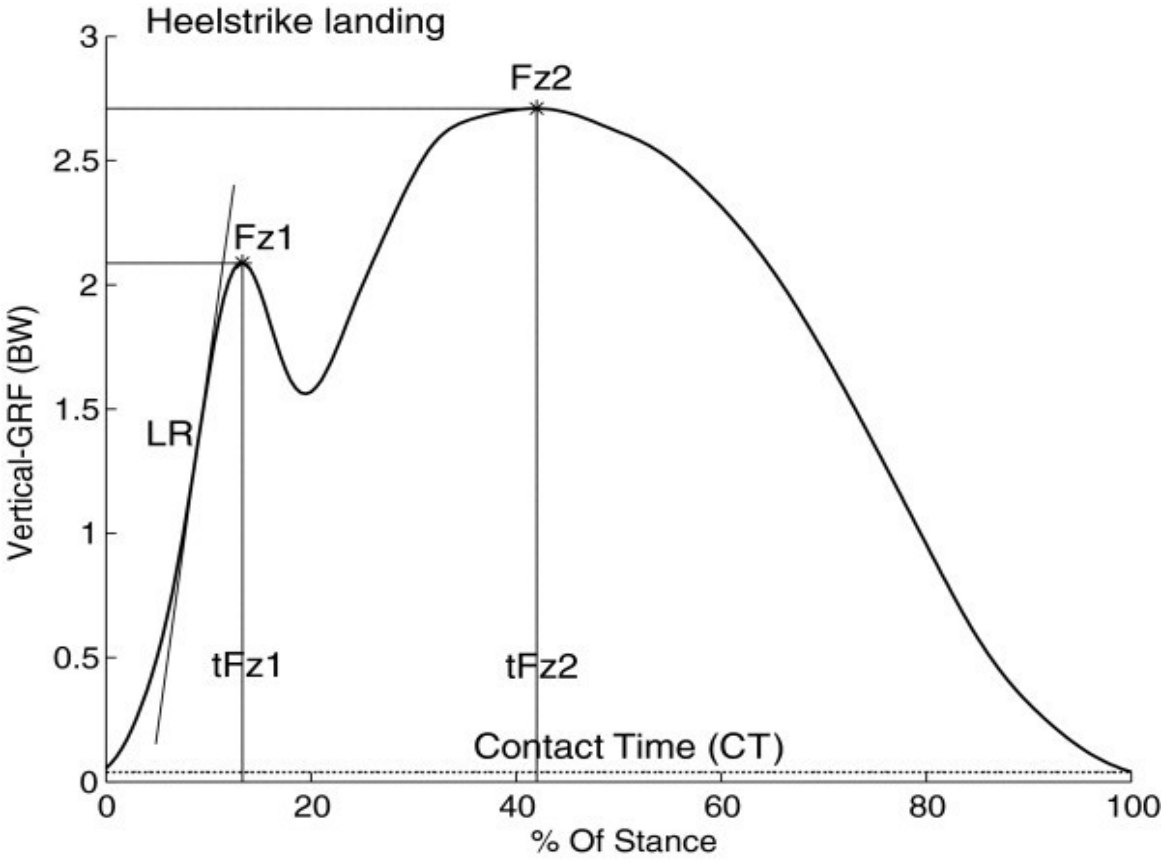
8 sessions of landing pattern modification

3 RF strikers with PFP

Followed for 3 months post retraining

>> Reduced symptoms

Kinetic results



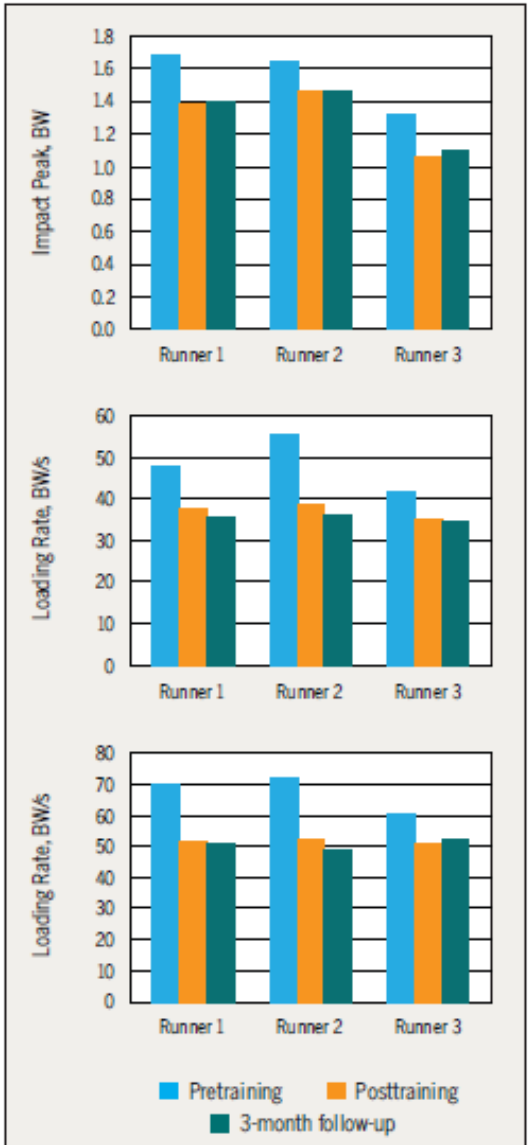


FIGURE 3. Vertical impact peak (A) and average (B) and instantaneous (C) vertical loading rates before and after the biofeedback training program. Abbreviation: BW, participant's body weight.

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

Evidence	Biomechanics

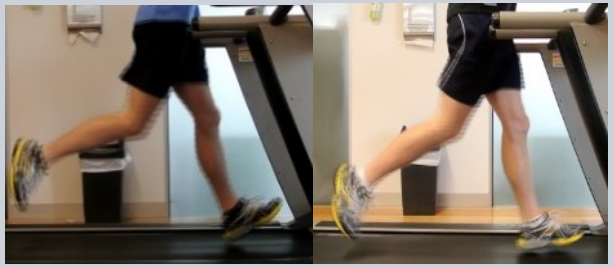
Intervention

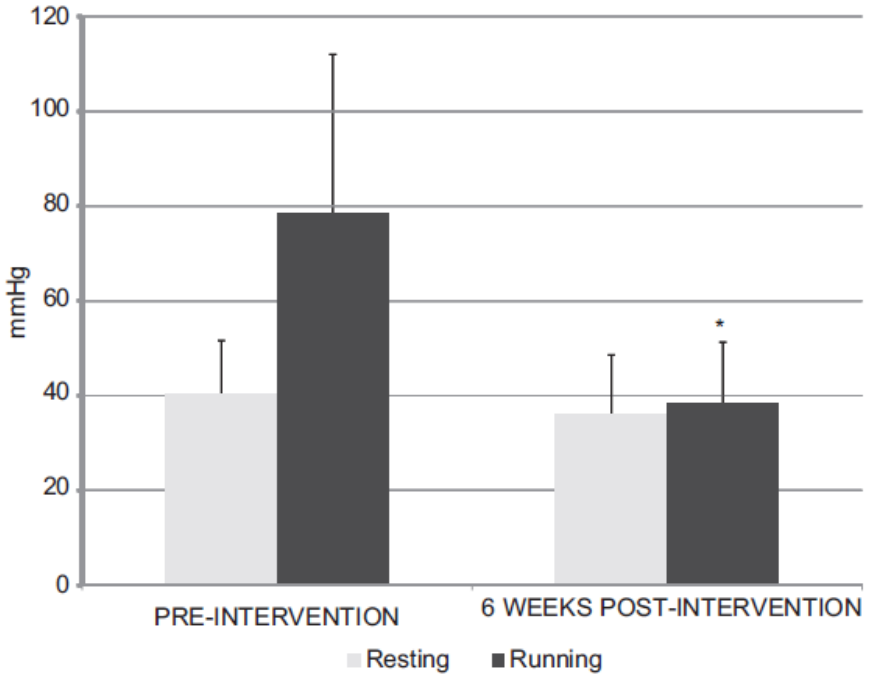
6 weeks

Transition from RFS to FFS/MFS

Outcome

Reduced pain and improve function





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

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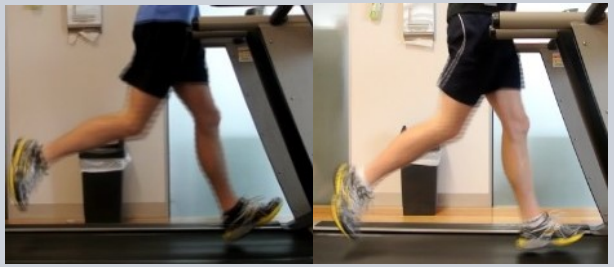
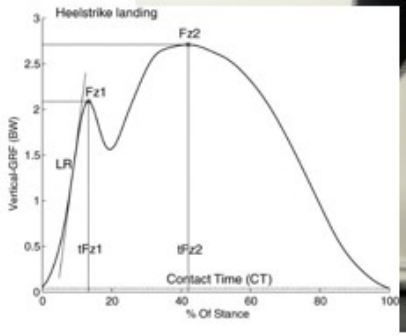
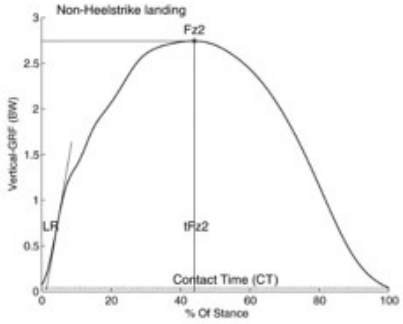
Intervention 6 weeks Transition from RFS to FFS/MFS **Outcome** Reduced pain and improve function 	**Strongly advocated** **Quick fix, change strike pattern** *"anterior compartment syndrome, that's really quick; that's a quick fix. (1)* *"once you start getting the calf working, they're going to absorb loads much better." (5)* *"if somebody presents me the very acute anterior compartment syndrome, then I'm gonna want to switch into a forefoot position pretty quickly." (11)* *"the evidence is probably strongest around anterior compartment syndrome." (13)*

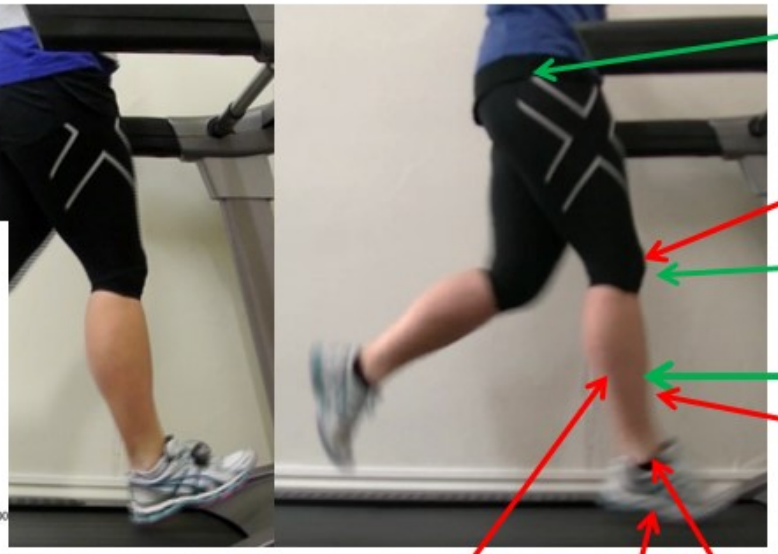
Transition from rearfoot to forefoot strike

↑ *peak vertical and AP GRF*

↓ *VILR*







↓ *Hip power absorption*

↑ *internal knee extension moment*

↓ *Knee power absorption*

↓ *TA muscle activity and forces*

↑ *PTA*

↑ *damping coefficient*

↑ *Gastocs and Sol muscle activity/forces*

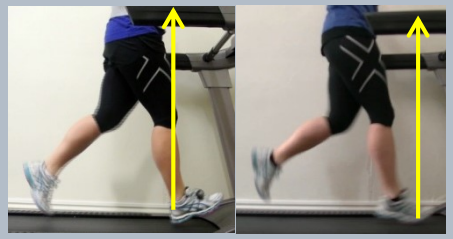
↑ *Arch strain*

↑ *internal ankle DF moment*

↑ *ankle power absorption*

↑ *distance from COM to strike point*

Strike pattern – practical considerations

Findings	Illustrative quotes
Potential dangers of changing strike patterns 	*"I think that if I just give the advice of someone to really change the foot strike, it could be dangerous." (1)* *"I just feel like the that risk that you're taking on if you're shifting a little too much (2)* *"We found initially that we were promoting a fore foot strike. A lot of the guys were really suffering with calf pain during that adaption period." (9)* *"Changing foot strike is quite a big intervention, and I think you often create problems from that."*
Other factors may be more important	*"You don't need to go down the path of changing it just because it is heel strike. As long as you're not overstriding." (5)* *"we would all start proximally ….. we're not really that bothered sort of forefoot to midfoot or rearfoot to midfoot as long as there's a close to midfoot as we feel will change the rest of the kinematics." (7)* *"where foot strikes relative to the centre of gravity, the actual foot strike pattern itself to a certain extent, but that's sort of less important." (13)*

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

Step rate – practical considerations

Findings	Illustrative quotes
Step rate increases should be gradual, possibly aiming for 180	*"I can subscribe also to the kind of "at 5% rule." (3) "probably don't wanna change it more than about 10%" (6) "I don't think that 180 cadence, a magic number is relevant." (7) "my range is between 170 to 190." (10) "A five to ten percent increase is a good cue." (13)*
Various ways to increase step rate	*"I use metronomes for sure in the clinic ….. plan for playing music that have that specific cadence." (1) "Clearly if you shorten your stride, you will increase your cadence." (7) "you tell them and say, "you need to take shorter strides" (8) "Some people are more visual, so they look the second on the board and I guess say it's three steps per second, one, two, three, one, two, three." (10)*

Increase step rate

↓ *gluteal muscle forces during stance*

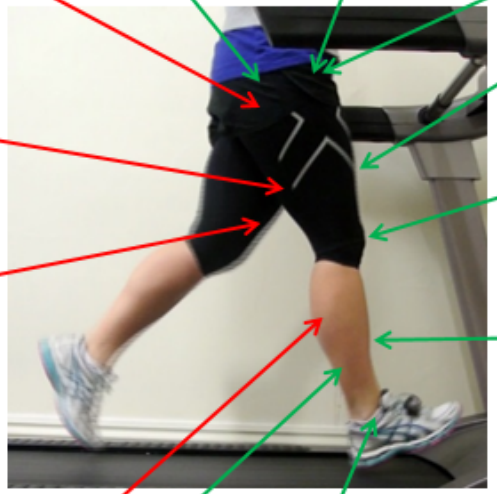
↓ hip energy absorption and peak internal hip extension moment
↓ *peak hip internal abduction and external rotation moment*

↓ *peak hip adduction*

↑ gluteal muscle activity and forces during late swing

↑ hamstring muscle activity and forces during late swing

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



↓ quadriceps forces during stance

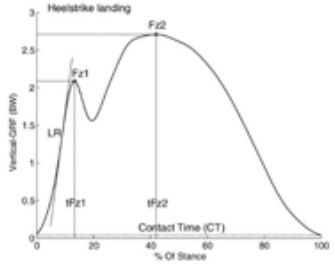
↓ PFJ stress/forces
↓peak knee flexion
↓ knee energy absorption and internal knee extension moment
↓ peak patellar tendon forces

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

↑ gastrocnemius muscle activity during late swing

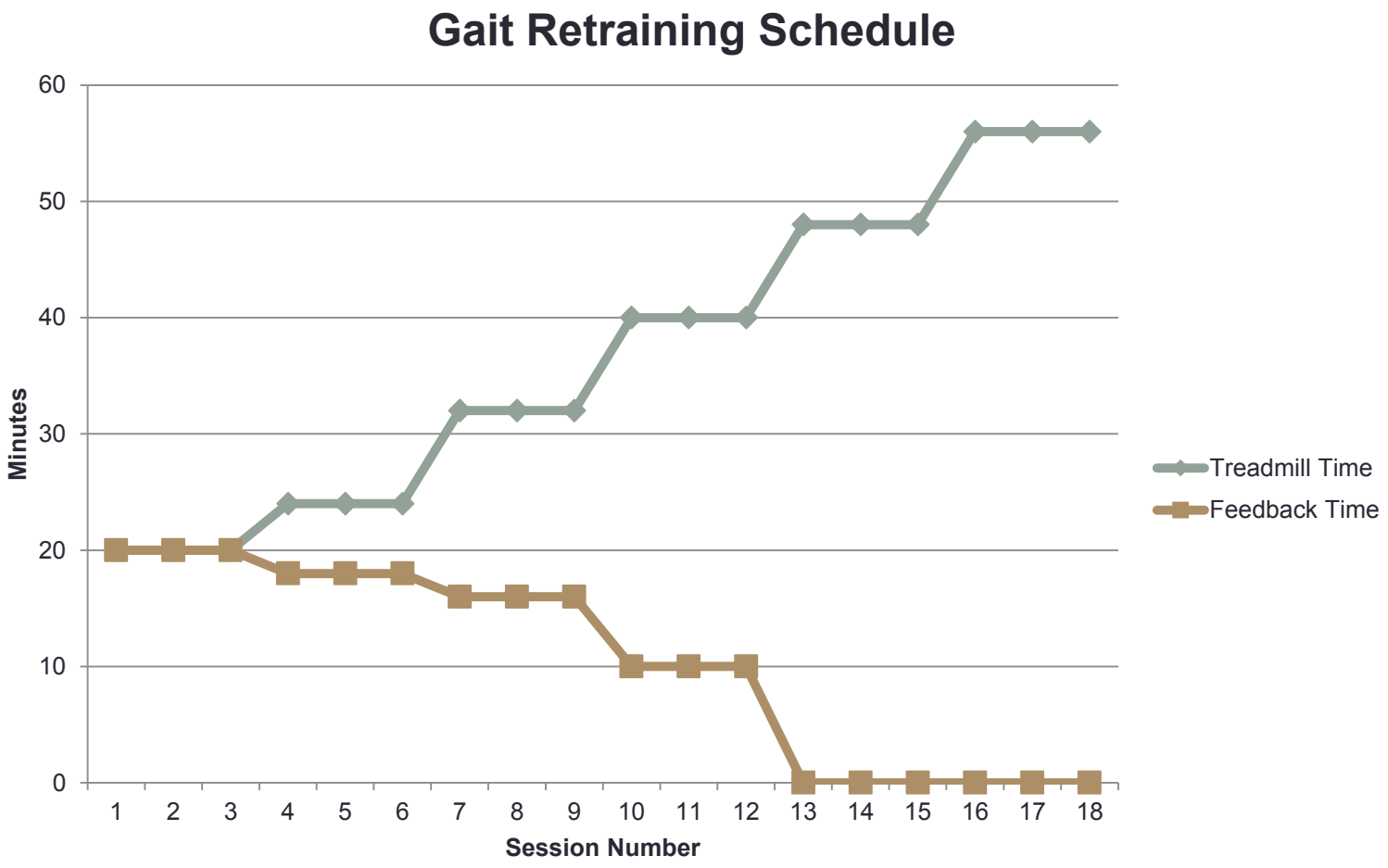
↓ soleus muscle forces during stance

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



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

A few practical considerations



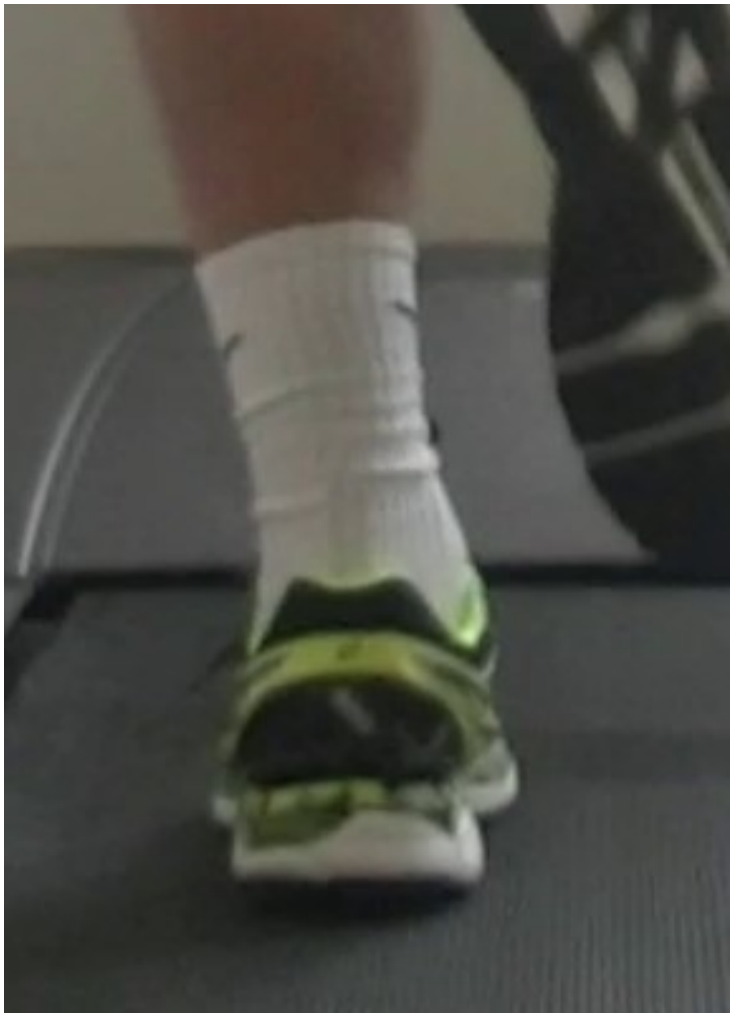
A few practical considerations

Findings	Illustrative quotes
Don't use too many cues	*"I'll try one or two cues and I'll really hammer those." (5) "We learnt early on that actually if you try to overload these people with three or four cues, they're thinking of them all the time, that doesn't work." (7) "(I) deliver as few coaching points as I can, sometimes just one or two. Three, if I think it's absolutely necessary." (9) "I'll go through a whole heap of different cues and choose one." (13)*
Individual response to cues and importance of communication	*"Some people respond really, really well to watching the video and they're very in tune with their body and they'll just do it. Other people, you've got to use ten different cues and different ways of phrasing things and then eventually they get it." (6) "Everyone's very different and some people will respond very well to one cue and totally not respond to others." (13)*

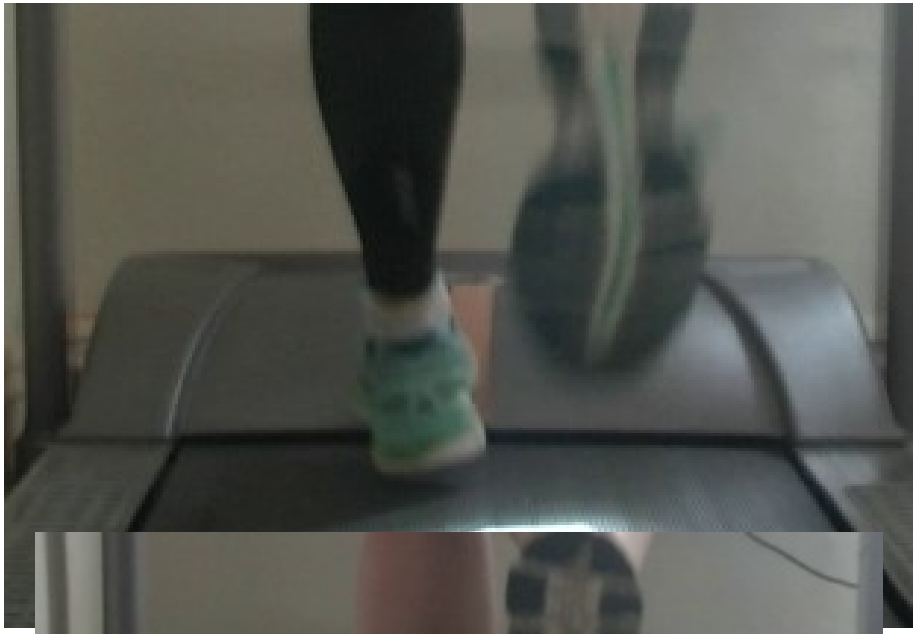
A few practical considerations

Findings	Illustrative quotes
Possible barriers include flexibility, strength, posture and cognition	*"how difficult it is for the patient change due to maybe underlying soft tissue tightness or weakness or whatever it might be" (6)* *"We've got a reasonable idea of what is going on with their posture, so that we're not asking them to do the impossible." (12)* *"I think it's very much on an individual's aptitude and the coach's ability to alter the cues." (7)*
Running retraining is part of the solution	*"I think gait retraining itself is not the standalone answer to any of these things ….. the whole gait retraining side of things, it needs to come hand in hand with a solid rehab program." (3)* *"Some can be changed straight away. Others will require a lot of manual therapy or strengthening exercise, endurance-based exercise to be able to facilitate that change, sometimes footwear, sometimes orthotics, sometimes taping as well." (6)* *"It's probably just gonna be one piece in the puzzle." (12)*

What about the foot?



Lateral forefoot pain



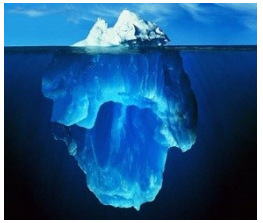
So what do we do here?

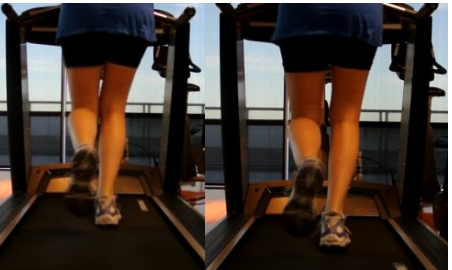
Manage 'RISK' in the injured runner

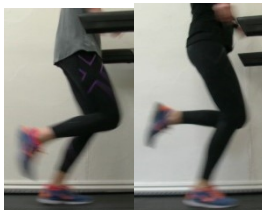
Principle of 'RISK' management	General strategies
R educe overall load	- Reduce running - Address over-stride - Increase step rate
I mprove capacity to attenuate load	- Graduated loading - Strength and Conditioning - Muscle activation cues
S hift the load Most retraining strategies Start sagittal plane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

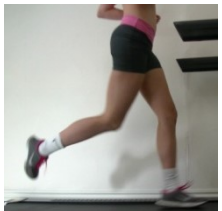
Take Home

1. Manage ‘RISK’ in the injured runner
2. Running retraining can effective reduce pain
3. There are a lot of running retraining options
4. Consider implications on the entire kinetic chain (S)
5. Running retraining is not a panacea



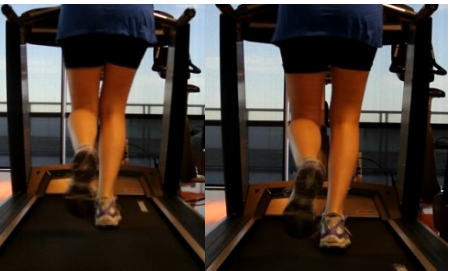
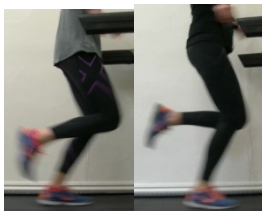


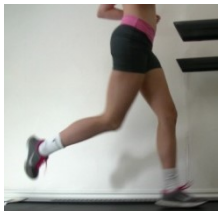




For the Podiatrist

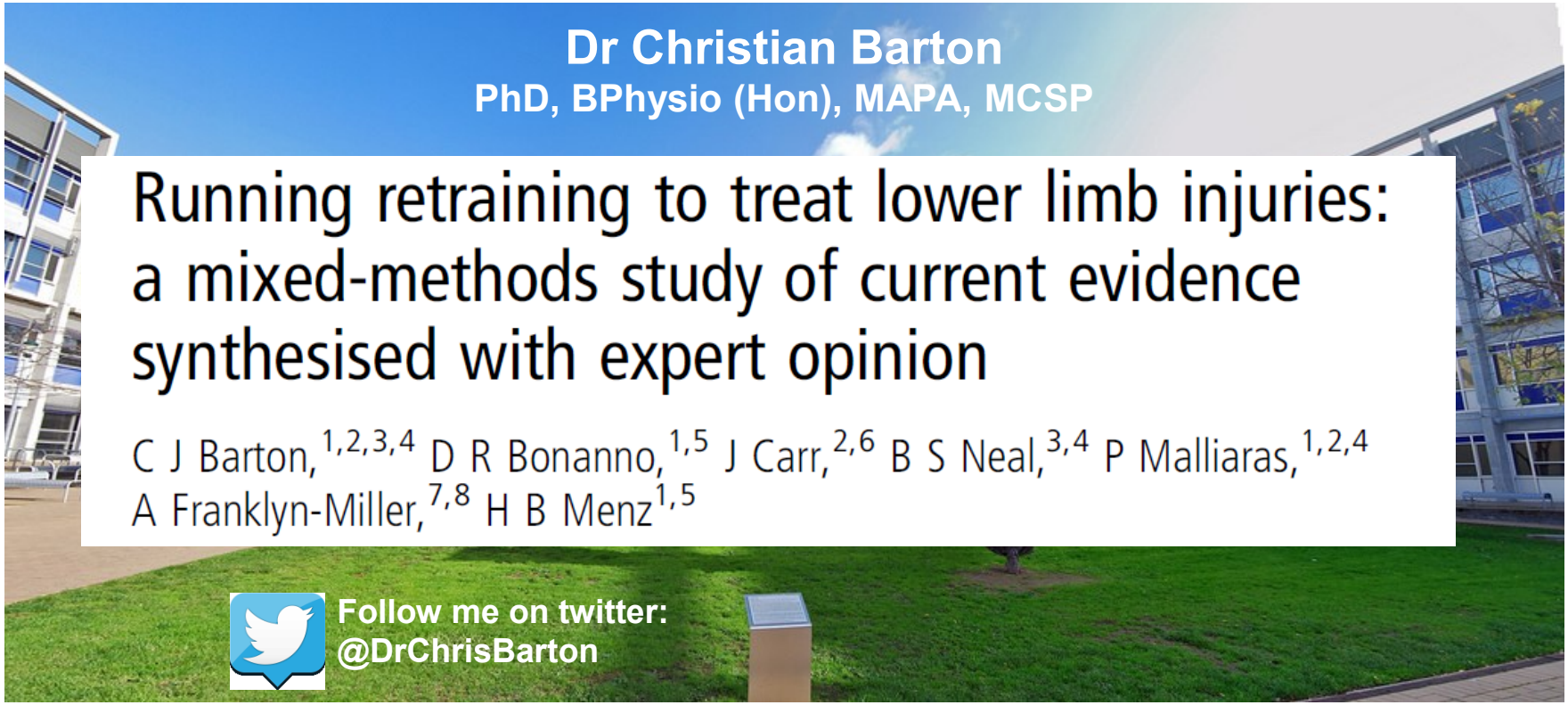
1. Embrace running retraining – first option?
2. Think sagittal plane first
3. Step rate simple and safe
4. Understand implications of strike pattern
5. Ignore proximal mechanics at your (patients) peril




Running retraining can treat lower limb injury

- Are you inspired?



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