

# Running Retraining for early onset OA

**Dr Christian Barton**

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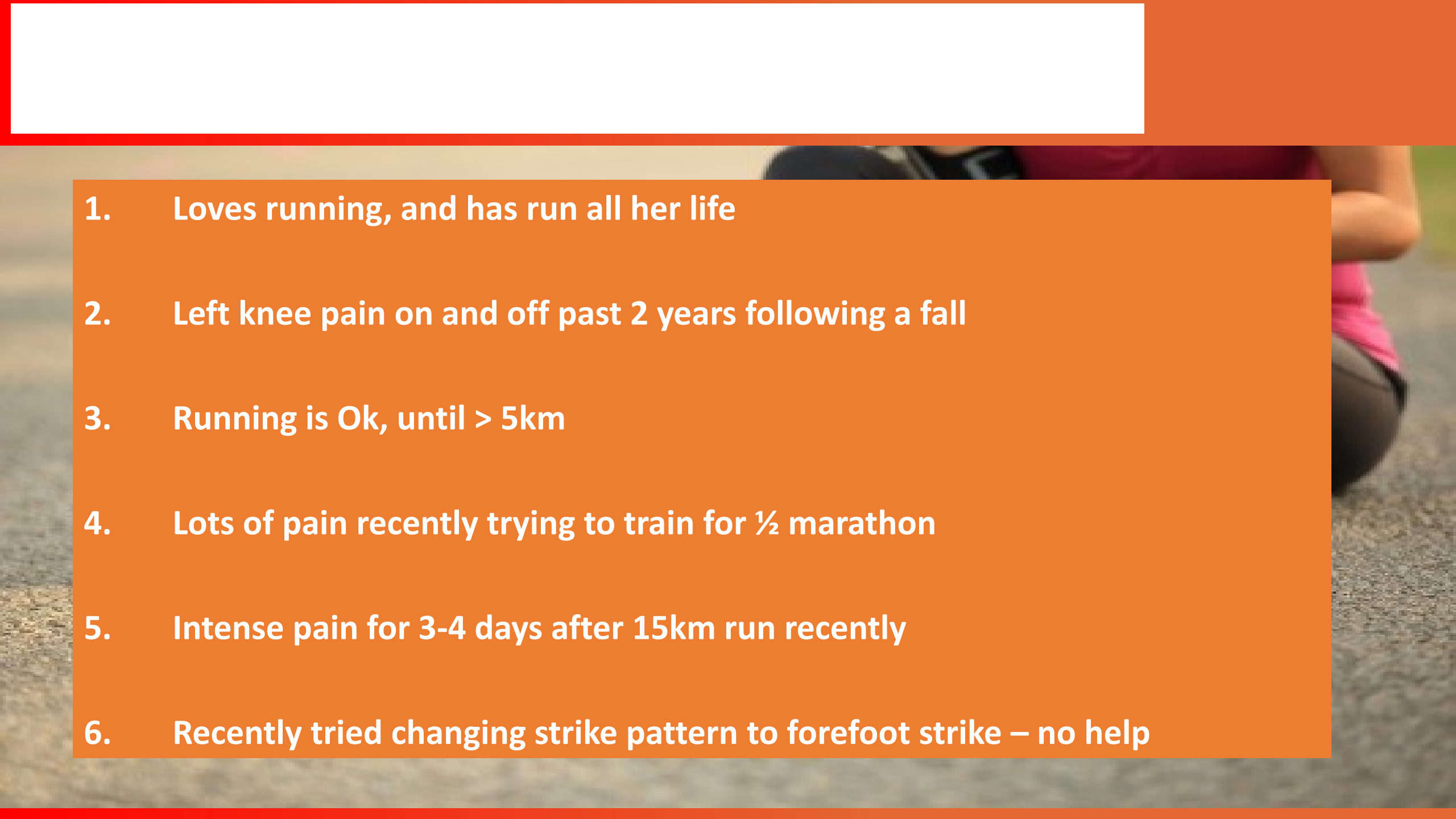
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Associate Editor British Journal of Sports Medicine and Physical Therapy in Sport

# OUTLINE

- Is running bad for you knees?
- Should you run with knee OA?
- Should you run through pain?
- How can we manage the RISK of running with knee OA?





- 
1. Loves running, and has run all her life
  2. Left knee pain on and off past 2 years following a fall
  3. Running is Ok, until > 5km
  4. Lots of pain recently trying to train for ½ marathon
  5. Intense pain for 3-4 days after 15km run recently
  6. Recently tried changing strike pattern to forefoot strike – no help

- 
1. Extruded medial meniscus, with horizontal tear periphery of the posterior horn and tiny vertical tear free edge posterior horn.

“You should give up on trying to return to running” – joint degeneration

4. Moderate joint effusion and synovitis.

Offered cortisone injection

“You should consider an arthroscopy”





# Running destroys your knees right?

RISKS

BENEFITS



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## Is There an Association between Running and Osteoarthritis? A

Table 1. Characteristics of those with no history of running and those with a history of running

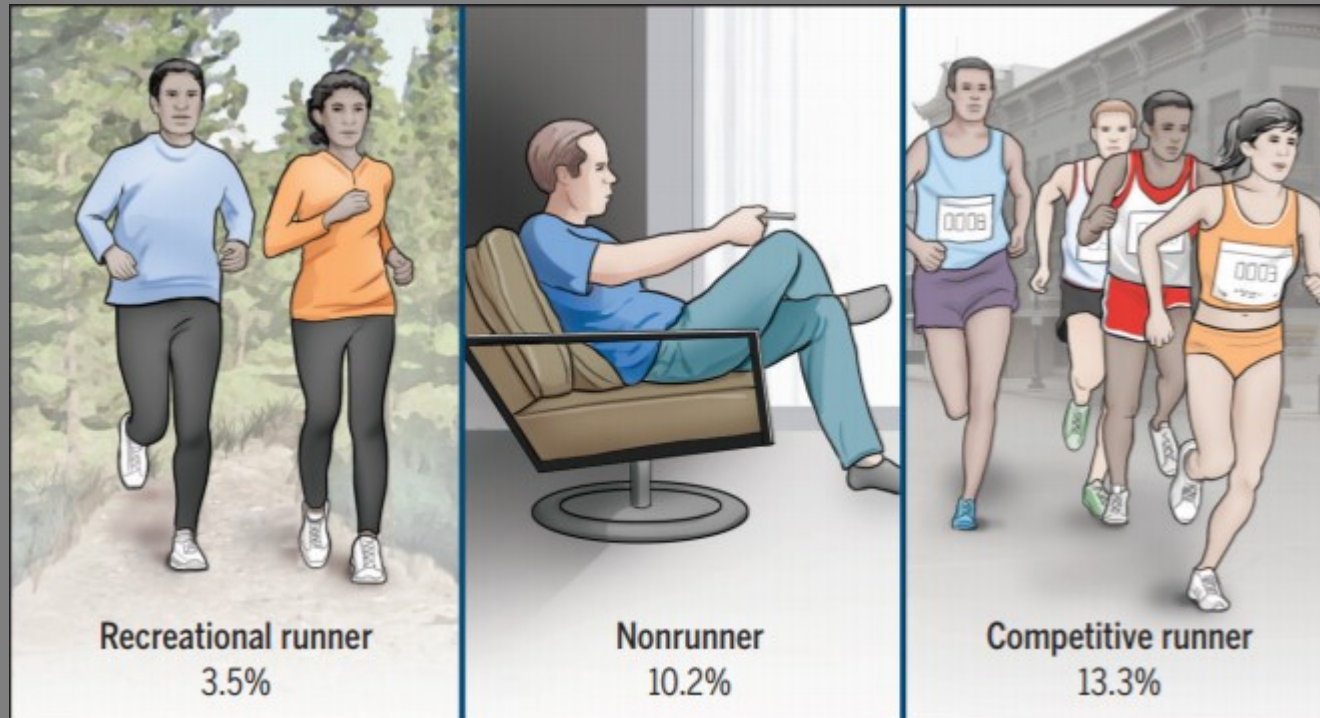
Participant characteristics	No history of running (n = 618)†	History of running (n = 618)†
Age, y	67.0 ± 9.4	67.0 ± 9.4
Male sex, %	32.5	38.8
BMI, kg/m <sup>2</sup>	28.7 ± 5.1	29.1 ± 5.2
Frequent running, %	39.3	50.4
Radiographic OA, %	57.3	65.7
Symptomatic OA, %	27.4	37.0
TKR, %§	4.0	7.0
Prior injury, %	48.9	55.5

History of leisure-time running not associated with:  
↑ knee pain  
↑ radiographic OA  
↑ symptomatic OA

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CYNTHIA L. GREEN, PhD<sup>7</sup> • MOHIT BHANDARI, MD, PhD<sup>8</sup> • JÓN KARLSSON, MD, PhD<sup>5</sup>

# The Association of Recreational and Competitive Running With Hip and Knee Osteoarthritis: A Systematic Review and Meta-analysis

25 studies



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## Running and Knee Osteoarthritis: A Systematic Review and Meta-analysis

Kate A. Timmins, PhD, Richard D. Leech, MSc, Mark E. Batt, MB BChir, DM, FFSEM, Kimberley L. Edwards, PhD§

First Published August 20, 2016

15 studies: 11 cohort (6 retrospective) and 4 cross-sectional studies

**“With this evidence, it is not possible to  
advocate for or against the role of running in knee OA.”**

Meta-analysis suggested a protective effect of running against surgery due to OA: pooled odds ratio 0.46 (95% CI, 0.30-0.71).



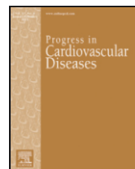
# RUNNING?

1. Pain?
2. ??OA progression??

RISKS

BENEFITS





## Running as a Key Lifestyle Medicine for Longevity



Duck-chul Lee<sup>a,\*</sup>, Angelique G. Brellenthin<sup>a</sup>, Paul D. Thompson<sup>b</sup>, Xuemei Sui<sup>c</sup>, I-Min Lee<sup>d</sup>, Carl J. Lavie<sup>e</sup>

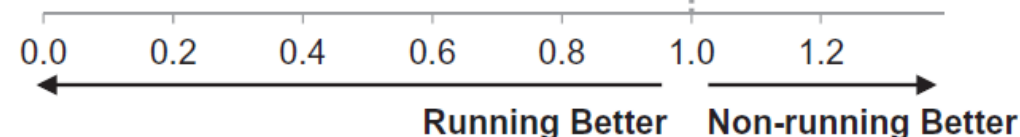


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### Subgroup

### 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 <sup>2</sup>		0.73 (0.64-0.83)
BMI ≥25 kg/m <sup>2</sup>		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 <sup>2</sup>		0.70 (0.64-0.77)
Excluded abnormal ECG		0.70 (0.64-0.78)
<b>Overall</b>		<b>0.70 (0.64-0.77)</b>







## Running as a Key Lifestyle Medicine for Longevity



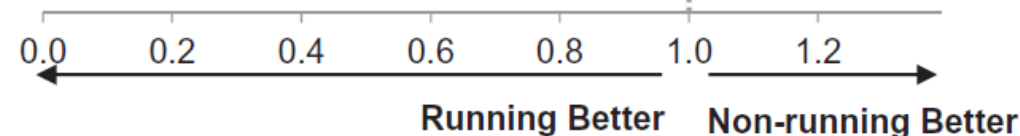
Duck-chul Lee<sup>a,\*</sup>, Angelique G. Brellenthin<sup>a</sup>, Paul D. Thompson<sup>b</sup>, Xuemei Sui<sup>c</sup>, I-Min Lee<sup>d</sup>, Carl J. Lavie<sup>e</sup>



### Subgroup

### Hazard Ratio (95% CI) of Cardiovascular Disease Mortality

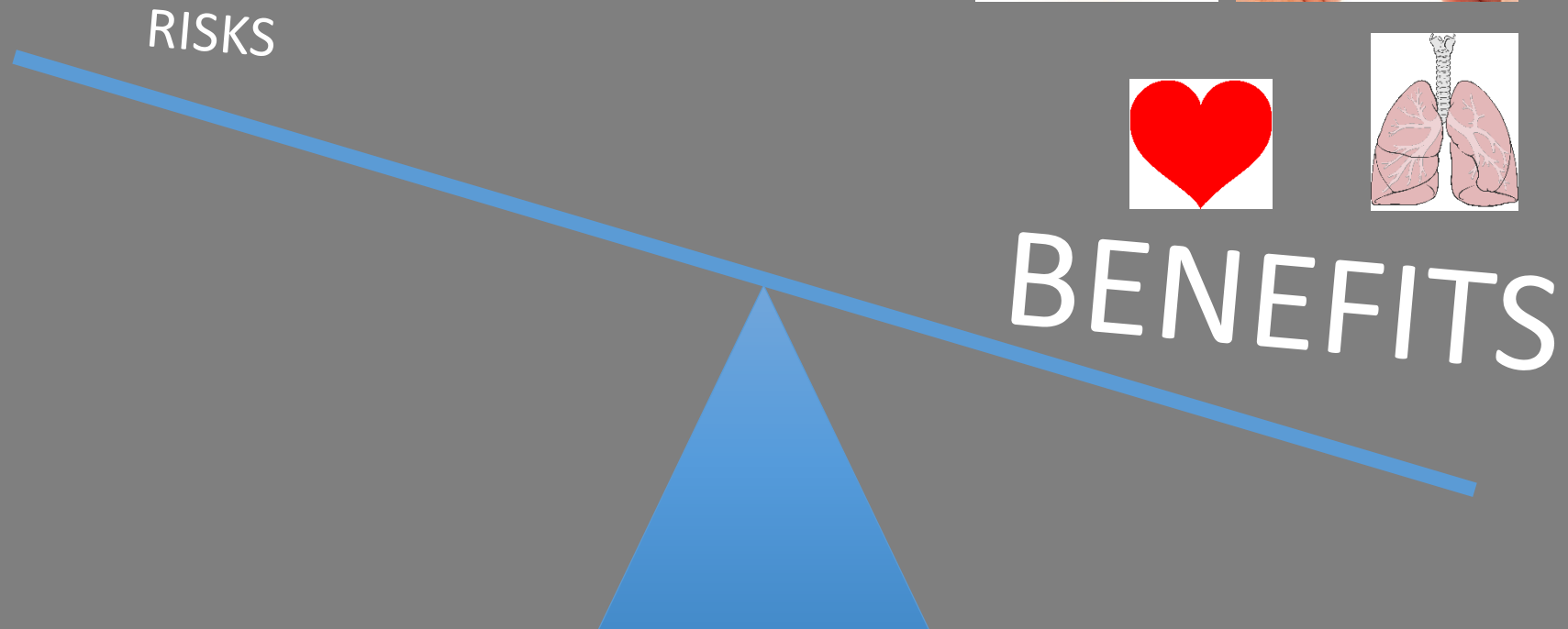
Men		0.56 (0.47-0.67)
Women		0.32 (0.16-0.64)
Age <50 yr		0.51 (0.39-0.68)
Age ≥50 yr		0.60 (0.49-0.74)
BMI <25 kg/m <sup>2</sup>		0.64 (0.50-0.83)
BMI ≥25 kg/m <sup>2</sup>		0.57 (0.45-0.72)
Healthy individuals		0.70 (0.50-0.99)
Unhealthy individuals		0.58 (0.48-0.70)
Non-smokers		0.62 (0.52-0.75)
Smokers		0.34 (0.21-0.55)
Non-heavy alcohol drinkers		0.55 (0.46-0.67)
Heavy alcohol drinkers		0.56 (0.38-0.81)
Excluded first 3 years of deaths		0.56 (0.47-0.66)
Excluded BMI <18.5 kg/m <sup>2</sup>		0.55 (0.46-0.65)
Excluded abnormal ECG		0.53 (0.43-0.64)
<b>Overall</b>		<b>0.55 (0.46-0.65)</b>



# RUNNING?

1. Pain?
2. ??OA progression??

Prevent at least 35  
chronic conditions (Booth 2012)



“You should give up on trying to return to running” – joint degeneration

#### Principle of ‘RISK’ management

**R**educe overall load

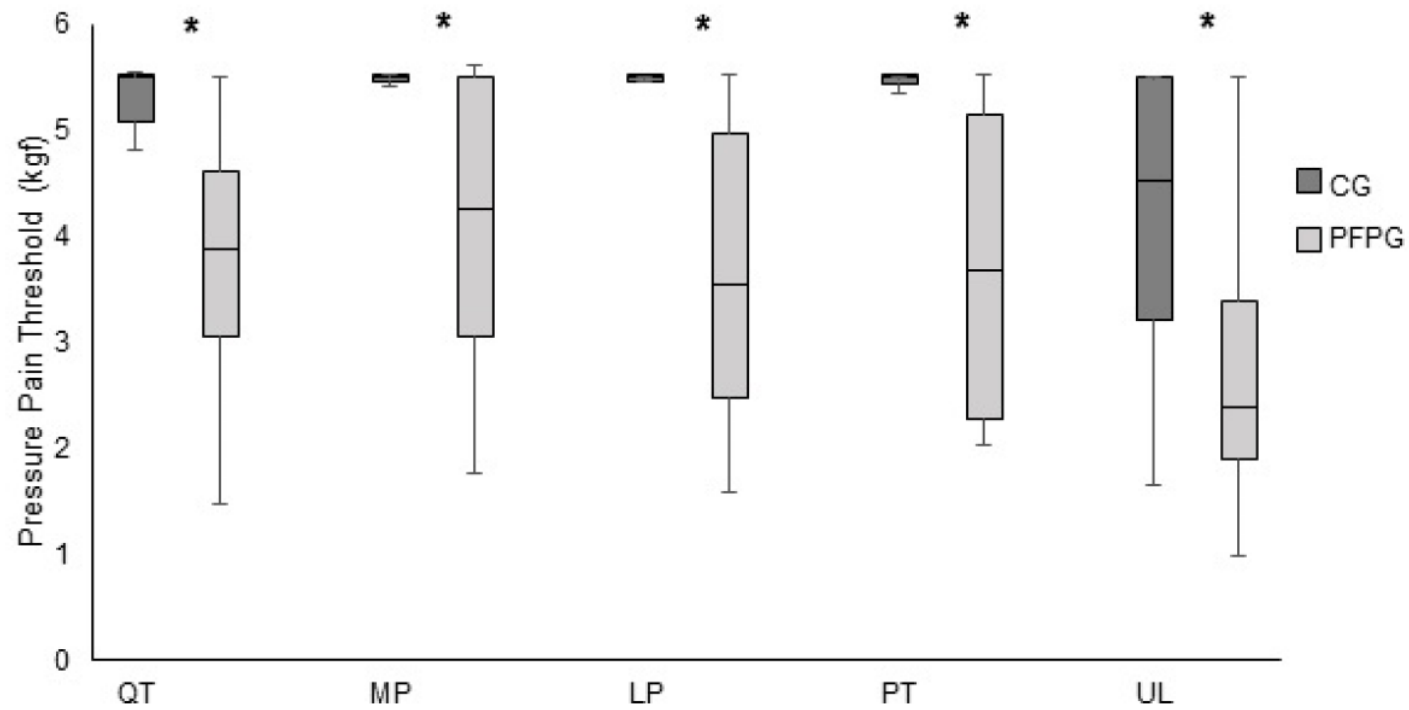
**I**mprove capacity to attenuate load

**S**hift the load

**K**eep adapting to the capacity and goals of the runner







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**Journal of Science and Medicine in Sport**

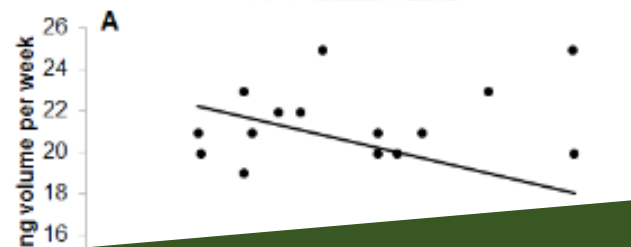
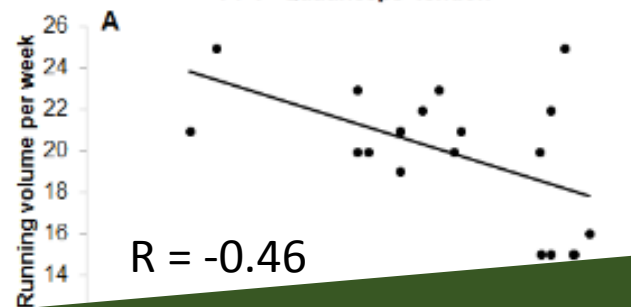
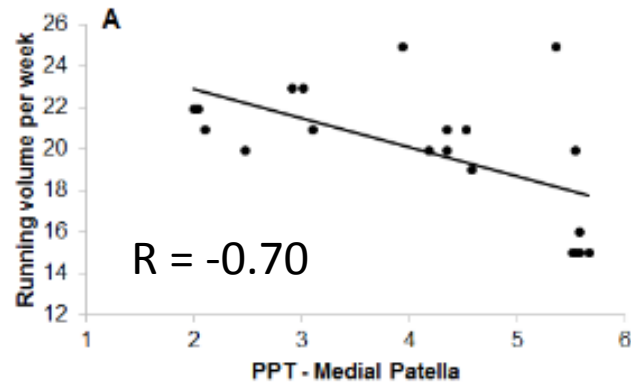
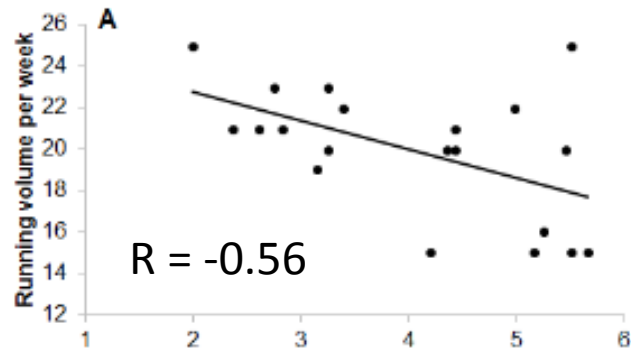
journal homepage: [www.elsevier.com/locate/jsams](http://www.elsevier.com/locate/jsams)

Original research

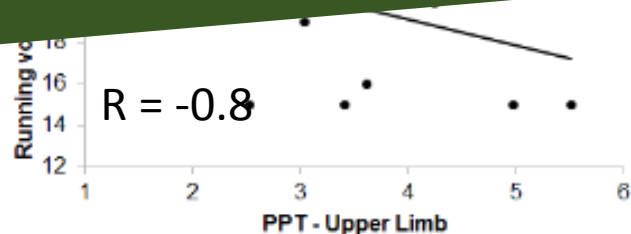
**Local and widespread hyperalgesia in female runners with patellofemoral pain are influenced by running volume**

Marcella Ferraz Pazzinatto<sup>a</sup>, Danilo de Oliveira Silva<sup>a</sup>, Juliana Pradela<sup>a</sup>, Maira Bergamaschi Coura<sup>a</sup>, Christian Barton<sup>b,c</sup>, Fábio Mícolis de Azevedo<sup>a,\*</sup>

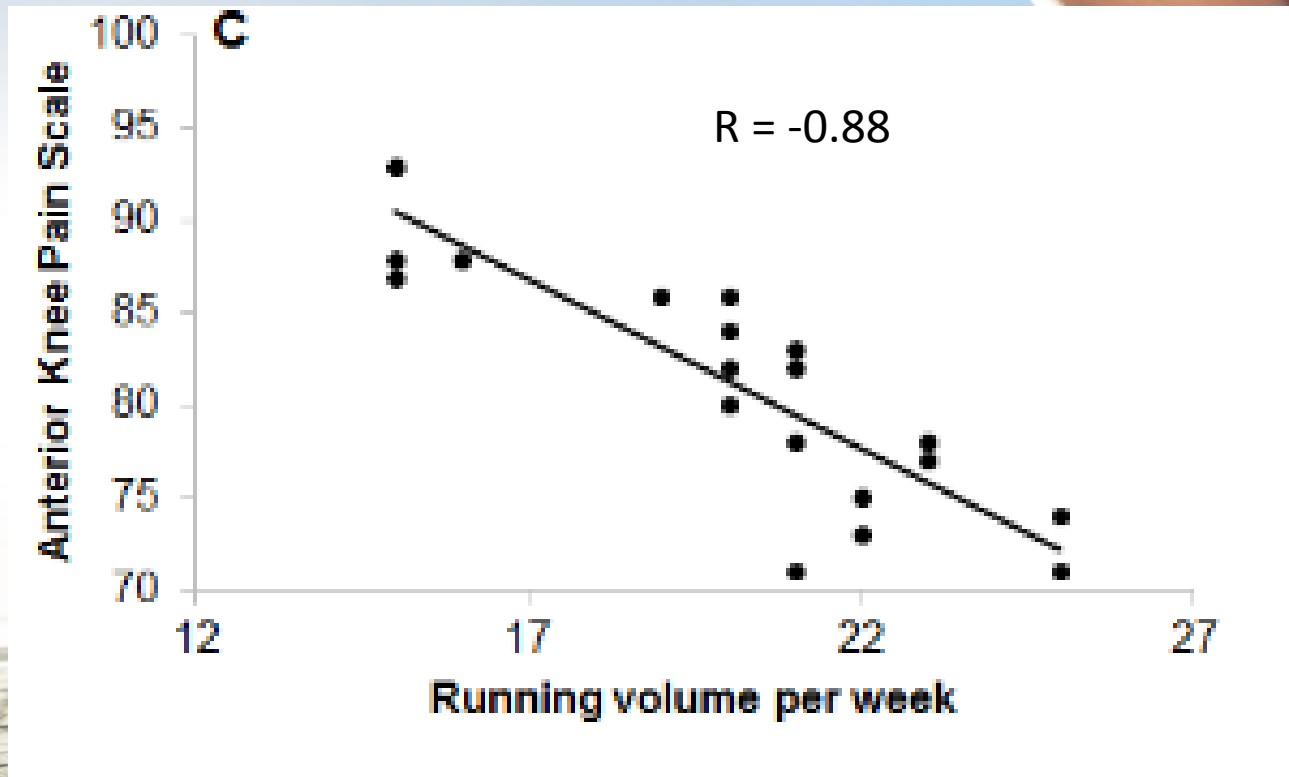
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All PPT measures associated with running volumes







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ELSEVIER

Original research

**Local and widespread hyperalgesia in female runners with patellofemoral pain are influenced by running volume**

Marcella Ferraz Pazzinatto<sup>a</sup>, Danilo de Oliveira Silva<sup>a</sup>, Juliana Pradela<sup>a</sup>, Maira Bergamaschi Coura<sup>a</sup>, Christian Barton<sup>b,c</sup>, Fábio Mícolis de Azevedo<sup>a,\*</sup>

CrossMark





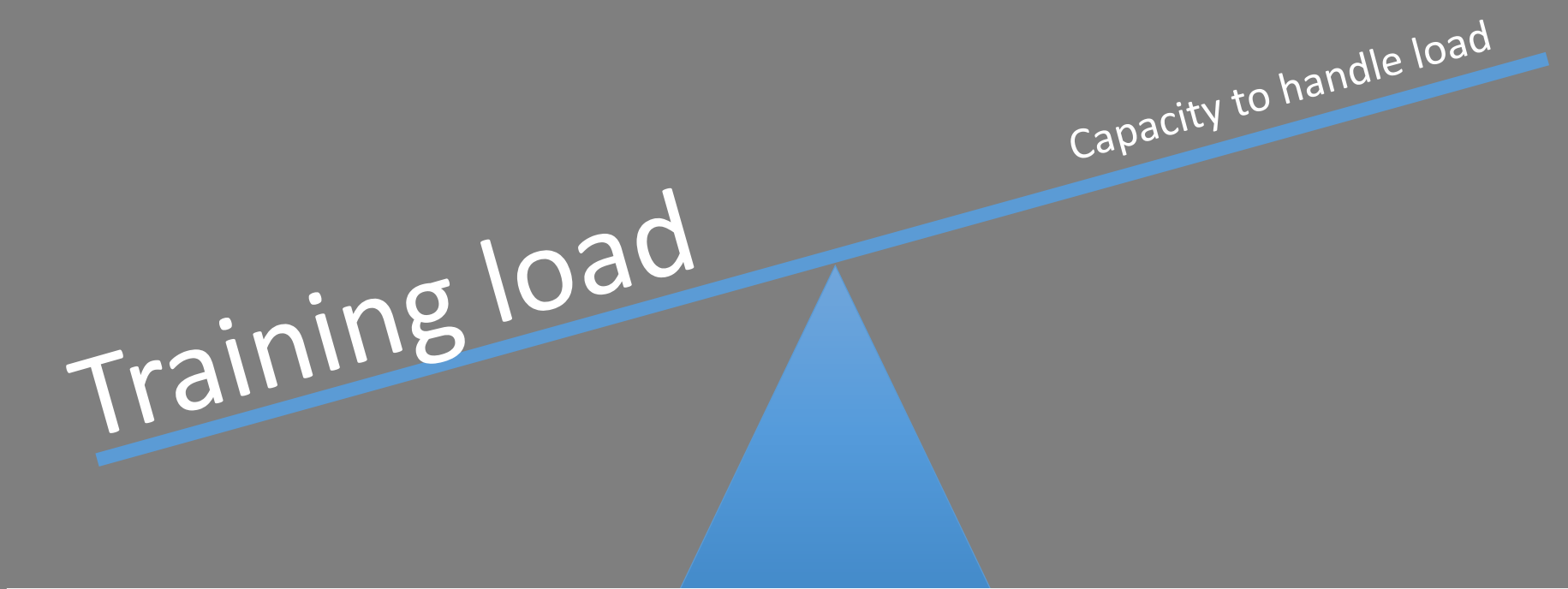
Pain

Maladaptive  
Behaviours

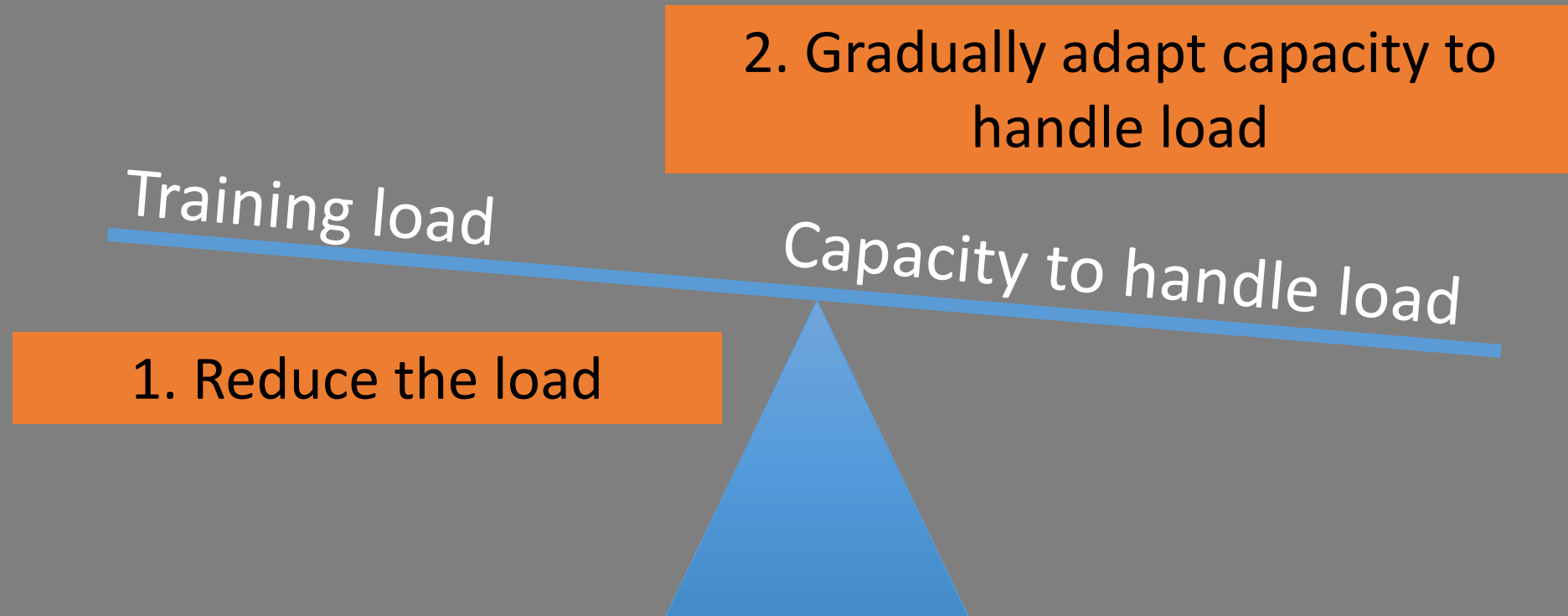
- Physical changes  
- Non-physical changes

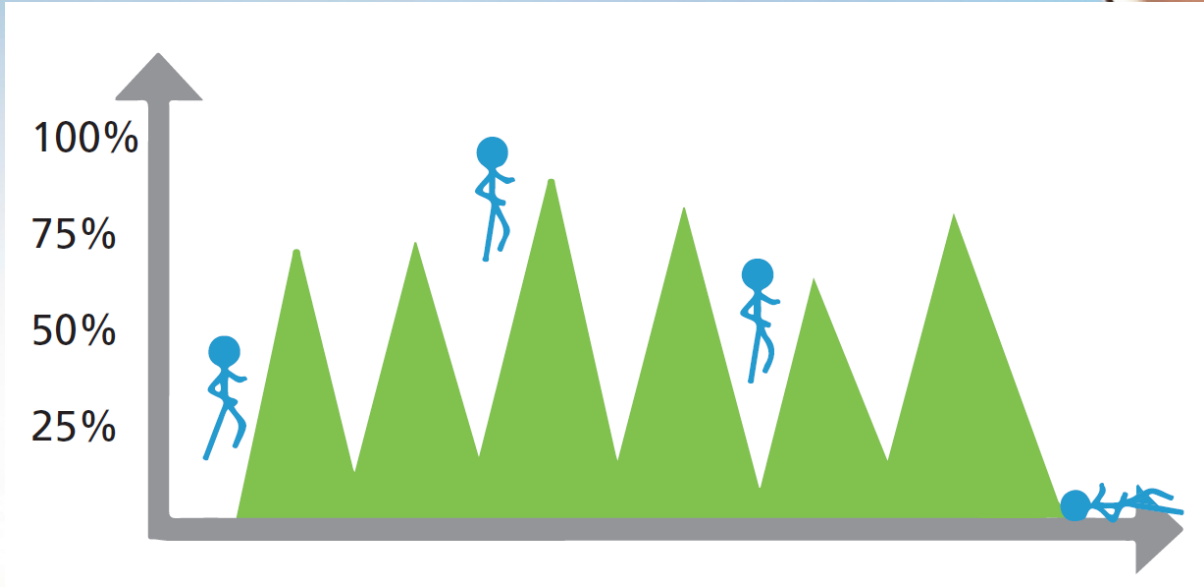
- Increased stress  
- Decreased capacity

# Load management

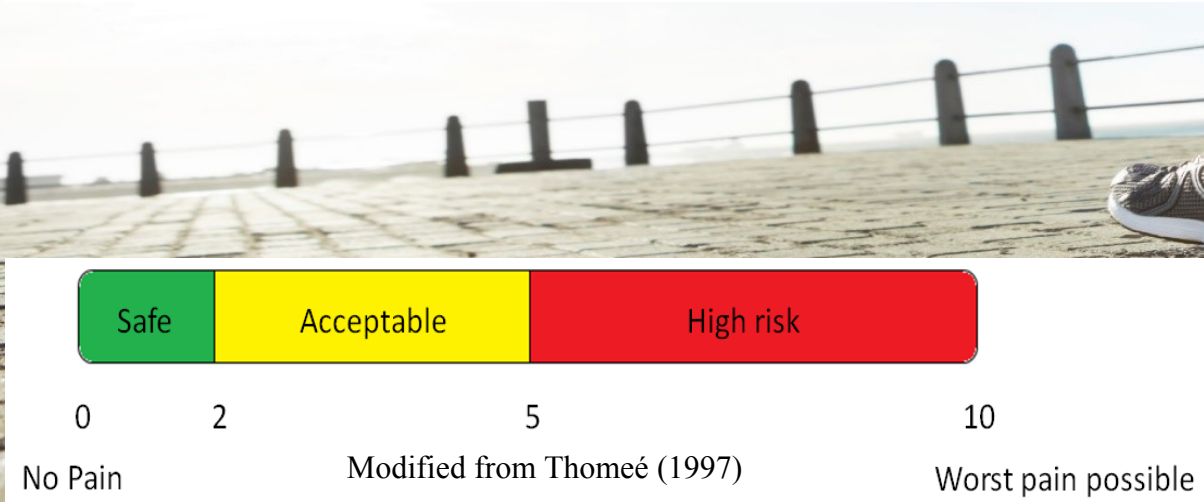


# Load management





**24**  
HOURS





Why does it  
still hurt!?!



It's not that simple!

Loading man

Load management is vitally important

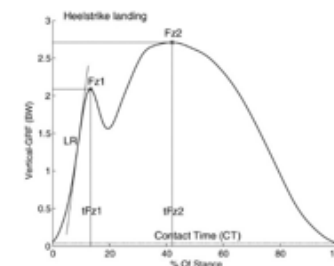
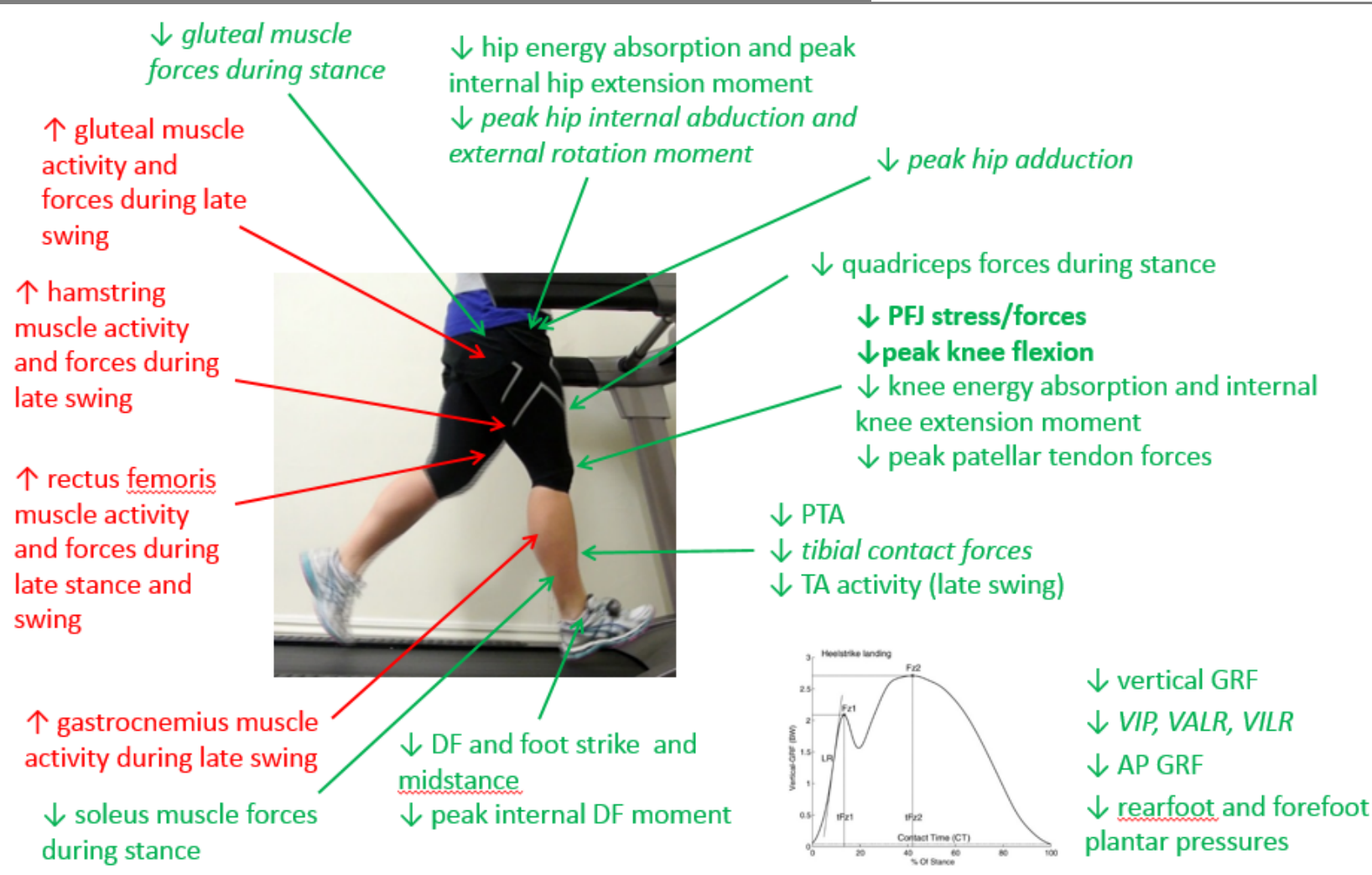
# Increase step rate



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

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

Review



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



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- ↑ frequency of sessions
- ↓ Sessions duration and speed
- Avoid down hills and stairs
- Max 2/10 pain and return to baseline at 60 minutes post cessation
- No pain ↑ following morning

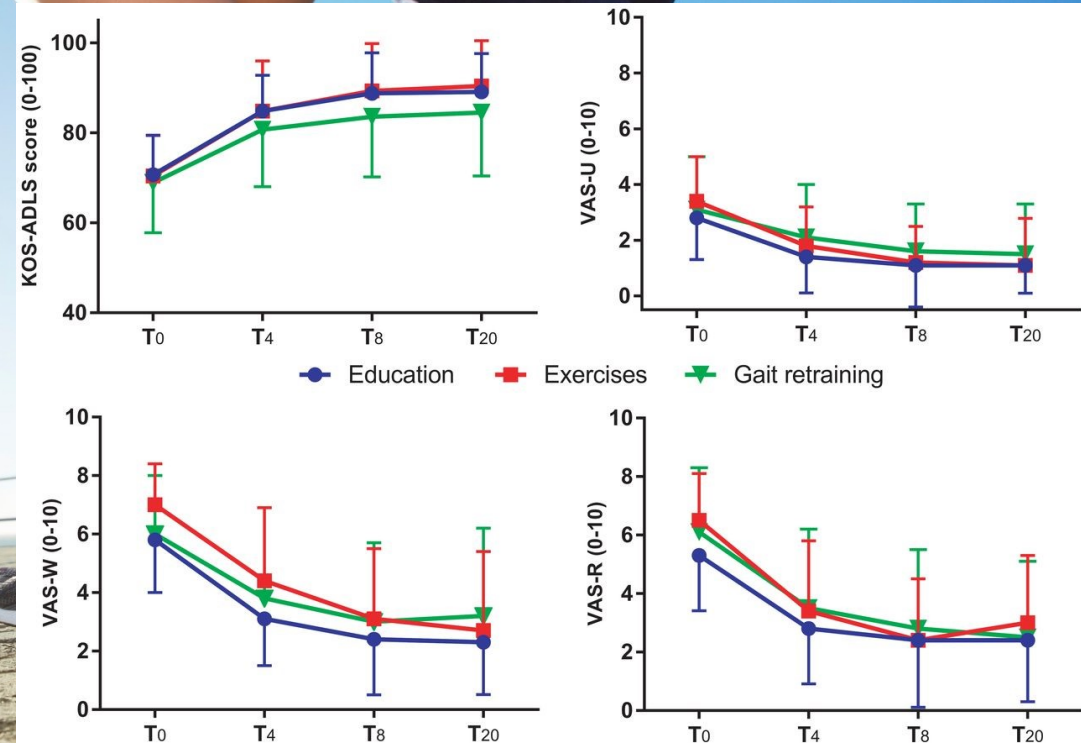
### Compared to:

- Education + Exercise
- Education + Gait retraining  
(increasing step rate 7.5%)

**BJSM**



- ↑ frequency of sessions
- ↓ Sessions duration and speed
- Avoid down hills and stairs
- Max 2/10 pain and return to baseline at 60 minutes post cessation
- No pain ↑ following morning



**BJSM**





# Is combining **↑ step rate** or an exercise programme with education better than education alone in treating runners with patellofemoral pain? A randomised clinical trial

Jean-Francois Esculier,<sup>1,2,3</sup> Laurent Julien Bouyer,<sup>1,2</sup> Blaise Dubois,<sup>1,3</sup> Pierre Fremont,<sup>1</sup> Sébastien Roy<sup>1,2</sup>

**Table 3** Treatment effects on symptoms and function outcomes

	Mean score change from baseline			Mean difference with Eeducation	
	Education	Exercises	Gait retraining	Exercises	Gait retraining
<b>KOS-ADLS (0–100)</b>					
T <sub>4</sub>	14.1 (8.0 to 20.2)*	14.4 (8.3 to 20.5)*	11.8 (5.7 to 17.9)*	0.3 (–5.7 to 6.3)	–2.3 (–8.8 to 4.2)
T <sub>8</sub>	18.1 (11.5 to 24.8)* <sup>†</sup>	18.8 (12.2 to 25.5)* <sup>†</sup>	14.7 (8.1 to 21.4)*	0.7 (–6.0 to 7.4)	–3.4 (–10.4 to 3.5)
T <sub>20</sub>	18.4 (11.7 to 25.1)*	20.0 (13.3 to 26.7)* <sup>†</sup>	15.6 (8.9 to 22.3)*	1.6 (–4.2 to 7.4)	–2.8 (–10.3 to 4.8)
Time effect $\eta^2$	0.695	0.657	0.488		
<b>VAS-U (0–10)</b>					
T <sub>4</sub>	–1.3 (–2.4 to –0.3)*	–1.6 (–2.6 to –0.6)*	–1.1 (–2.1 to –0.1)*	–0.3 (–1.2 to 0.7)	0.3 (–0.8 to 1.4)
T <sub>8</sub>	–1.6 (–2.7 to –0.6)*	–2.2 (–3.3 to –1.1)* <sup>†</sup>	–1.5 (–2.5, –0.4)*	–0.6 (–1.7 to 0.5)	0.2 (–0.9 to 1.3)
T <sub>20</sub>	–1.7 (–2.9 to –0.6)*	–2.3 (–3.5 to –1.2)* <sup>†</sup>	–1.6 (–2.7 to –0.4)*	–0.6 (–1.7 to 0.5)	0.1 (–1.1 to 1.3)
Time effect $\eta^2$	0.433	0.491	0.273		
<b>VAS-W (0–10)</b>					
T <sub>4</sub>	–2.7 (–4.1 to –1.3)*	–2.6 (–4.0 to –1.2)*	–2.2 (–3.6 to –0.8)*	0.1 (–1.1 to 1.3)	0.5 (–1.1 to 2.2)
T <sub>8</sub>	–3.4 (–4.9 to –2.0)*	–3.8 (–5.3 to –2.4)* <sup>†</sup>	–3.0 (–4.4 to –1.6)*	–0.4 (–1.8 to 1.0)	0.4 (–1.2 to 2.0)
T <sub>20</sub>	–3.5 (–5.1 to –1.9)*	–4.2 (–5.8 to –2.7)* <sup>†</sup>	–2.8 (–4.3 to –1.2)*	–0.7 (–2.2 to 0.8)	0.7 (–1.0 to 2.4)
Time effect $\eta^2$	0.587	0.624	0.345		
<b>VAS-R (0–10)</b>					
T <sub>4</sub>	–2.5 (–3.8 to –1.1)*	–3.1 (–4.5 to –1.8)*	–2.6 (–3.9 to –1.3)*	–0.7 (–1.9 to 0.6)	–0.1 (–1.5 to 1.2)
T <sub>8</sub>	–2.9 (–4.2 to –1.7)*	–4.1 (–5.4 to –2.9)* <sup>†</sup>	–3.3 (–4.6 to –2.1)*	–1.2 (–2.4 to 0.1)	–0.4 (–1.7 to 1.0)
T <sub>20</sub>	–2.9 (–4.2 to –1.6)*	–3.5 (–4.8 to –2.1)*	–3.6 (–4.9 to –2.3)*	–0.6 (–1.8 to 0.6)	–0.7 (–2.1 to 0.7)
Time effect $\eta^2$	0.623	0.631	0.486		
<b>Weekly running distance (km)</b>					
T <sub>8</sub>	1.6 (–1.6 to 4.7)	5.6 (2.4 to 8.7)*	3.3 (0.1 to 6.4)*	4.0 (0.4 to 7.6) <sup>§</sup>	1.7 (–1.9 to 5.3)
T <sub>20</sub>	–2.3 (–7.5 to 2.8)	–0.5 (–5.7 to 4.7) <sup>‡</sup>	–1.7 (–6.9 to 3.5)	1.9 (–4.6 to 8.3)	0.7 (–5.4 to 6.8)
Time effect $\eta^2$	N.S.	0.247	0.147		

Data presented as mean (95% CI). Intention to treat analyses (n=23 per group)



# Is combining gait retraining or an exercise programme with education better than education alone in treating runners with patellofemoral pain? A randomised clinical trial

Jean-Francois Esculier,<sup>1,2,3</sup> Laurent Julien Bouyer,<sup>1,2</sup> Blaise Dubuc,<sup>1,2</sup> ...

**Table 3** Treatment effects on symptoms and function outcomes

	Mean score change from baseline				
	Education	Exercises	Gait		
<b>KOS-ADLS (0–100)</b>					
T <sub>4</sub>	14.1 (8.0 to 20.2)*				
T <sub>8</sub>	18.1 (12.0 to 24.2)*				
T <sub>20</sub>	22.1 (16.0 to 28.2)*				
Time effect $\eta^2$	0.453	0.491	0.273		
<b>VAS</b>					
T <sub>4</sub>	–2.1 (–4.1 to –0.1)*	–0.3 (–1.2 to 0.7)	0.3 (–0.8 to 1.4)		
T <sub>8</sub>	–1.1 (–3.1 to 0.9)*	–1.5 (–2.5 to –0.4)*	–0.6 (–1.7 to 0.5)	0.2 (–0.9 to 1.3)	
T <sub>20</sub>	–2.3 (–3.5 to –1.2)*†	–1.6 (–2.7 to –0.4)*	–0.6 (–1.7 to 0.5)	0.1 (–1.1 to 1.3)	
Time effect $\eta^2$	0.453	0.491	0.273		
<b>VAS-W</b>					
T <sub>4</sub>	–2.7 (–4.1 to –1.3)*	–2.6 (–4.0 to –1.2)*	–2.2 (–3.6 to –0.8)*	0.1 (–1.1 to 1.3)	0.5 (–1.1 to 2.2)
T <sub>8</sub>	–3.4 (–4.9 to –2.0)*	–3.8 (–5.3 to –2.4)*†	–3.0 (–4.4 to –1.6)*	–0.4 (–1.8 to 1.0)	0.4 (–1.2 to 2.0)
T <sub>20</sub>	–3.5 (–5.1 to –1.9)*	–4.2 (–5.8 to –2.7)*†	–2.8 (–4.3 to –1.2)*	–0.7 (–2.2 to 0.8)	0.7 (–1.0 to 2.4)
Time effect $\eta^2$	0.587	0.624	0.345		
<b>VAS-R (0–10)</b>					
T <sub>4</sub>	–2.5 (–3.8 to –1.1)*	–3.1 (–4.5 to –1.8)*	–2.6 (–3.9 to –1.3)*	–0.7 (–1.9 to 0.6)	–0.1 (–1.5 to 1.2)
T <sub>8</sub>	–2.9 (–4.2 to –1.7)*	–4.1 (–5.4 to –2.9)*†	–3.3 (–4.6 to –2.1)*	–1.2 (–2.4 to 0.1)	–0.4 (–1.7 to 1.0)
T <sub>20</sub>	–2.9 (–4.2 to –1.6)*	–3.5 (–4.8 to –2.1)*	–3.6 (–4.9 to –2.3)*	–0.6 (–1.8 to 0.6)	–0.7 (–2.1 to 0.7)
Time effect $\eta^2$	0.623	0.631	0.486		
<b>Weekly running distance (km)</b>					
T <sub>8</sub>	1.6 (–1.6 to 4.7)	5.6 (2.4 to 8.7)*	3.3 (0.1 to 6.4)*	4.0 (0.4 to 7.6) <sup>§</sup>	1.7 (–1.9 to 5.3)
T <sub>20</sub>	–2.3 (–7.5 to 2.8)	–0.5 (–5.7 to 4.7) <sup>‡</sup>	–1.7 (–6.9 to 3.5)	1.9 (–4.6 to 8.3)	0.7 (–5.4 to 6.8)
Time effect $\eta^2$	N.S.	0.247	0.147		

Data presented as mean (95% CI). Intention to treat analyses (n=23 per group)

Exercise clearly helps



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

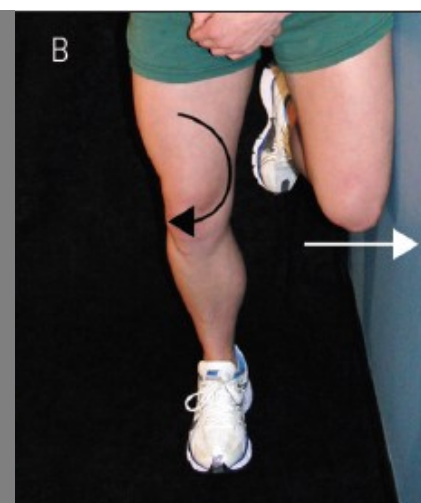


**TABLE 1**

## 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.



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

# 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



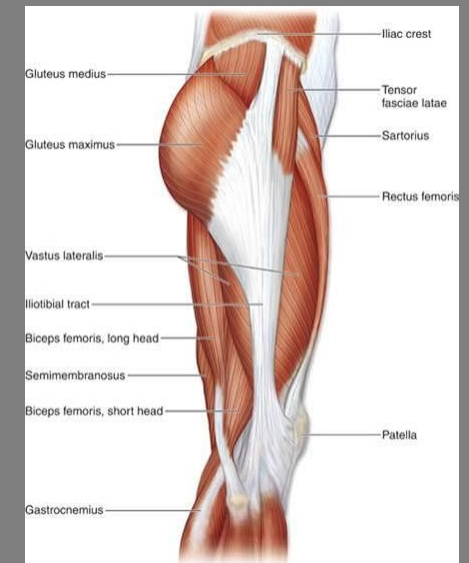


# Biomechanics defined

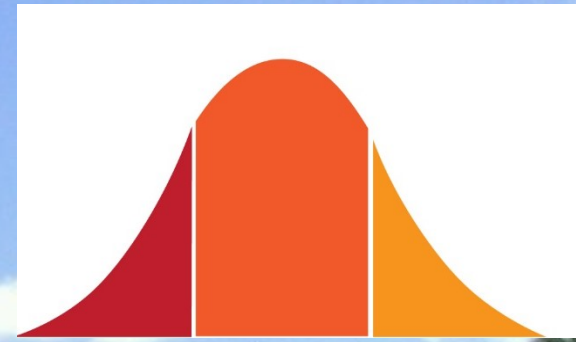
Three categories:

- 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?



# What is running retraining?

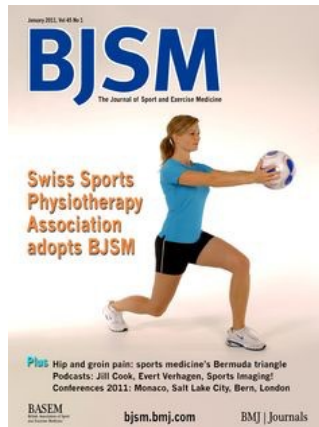


1. Identifying any theoretical (abnormal) running mechanics which may be contributing to tissue overload
2. Establish if running mechanics can be altered
3. Facilitate the desired running mechanics changes and encouraging motor learning to ensure maintenance of any change

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,<sup>1,2,3,4</sup> D R Bonanno,<sup>1,5</sup> J Carr,<sup>2,6</sup> B S Neal,<sup>3,4</sup> P Malliaras,<sup>1,2,4</sup>  
A Franklyn-Miller,<sup>7,8</sup> H B Menz<sup>1,5</sup>

*“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”*



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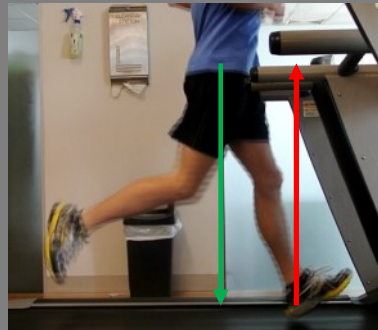
# Key considerations in knee

## Proximal

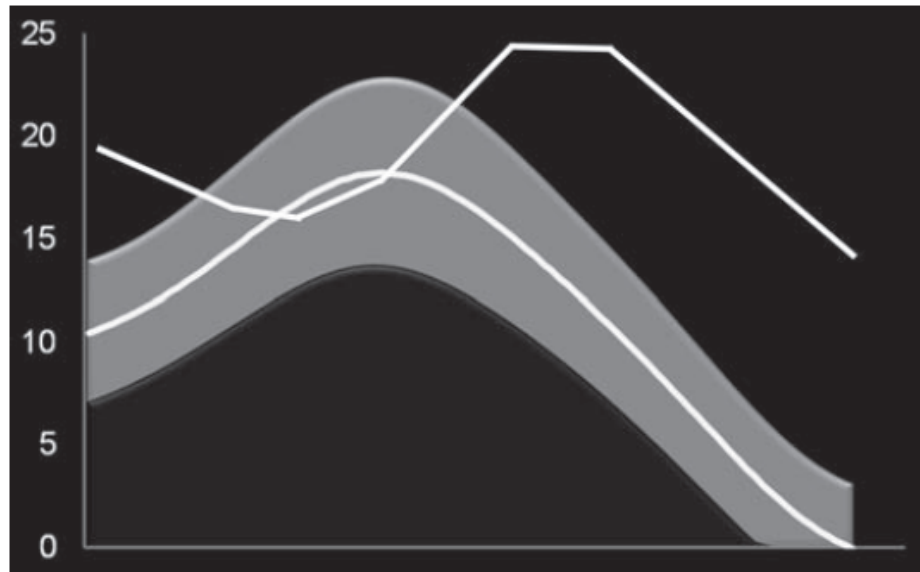
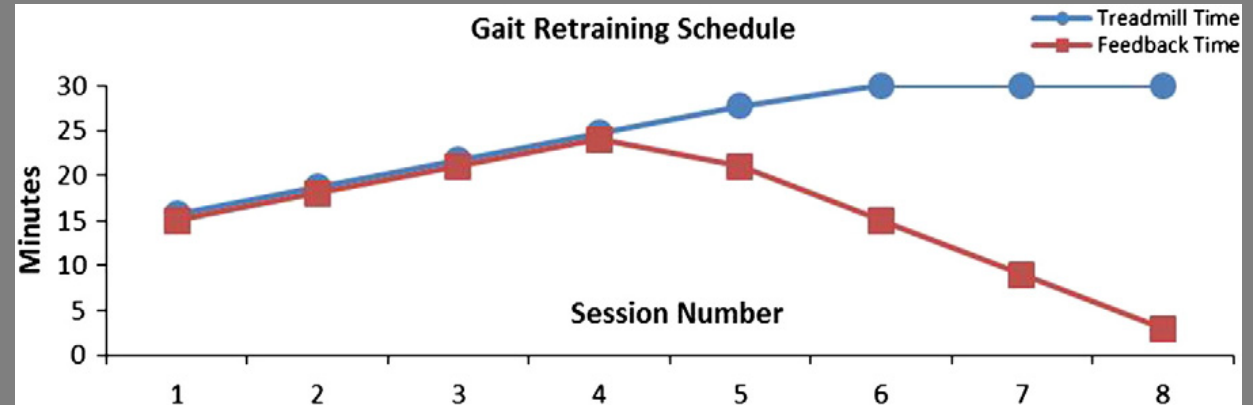
- Pelvic drop
- **Hip control**
- Knee flexion

## Distal

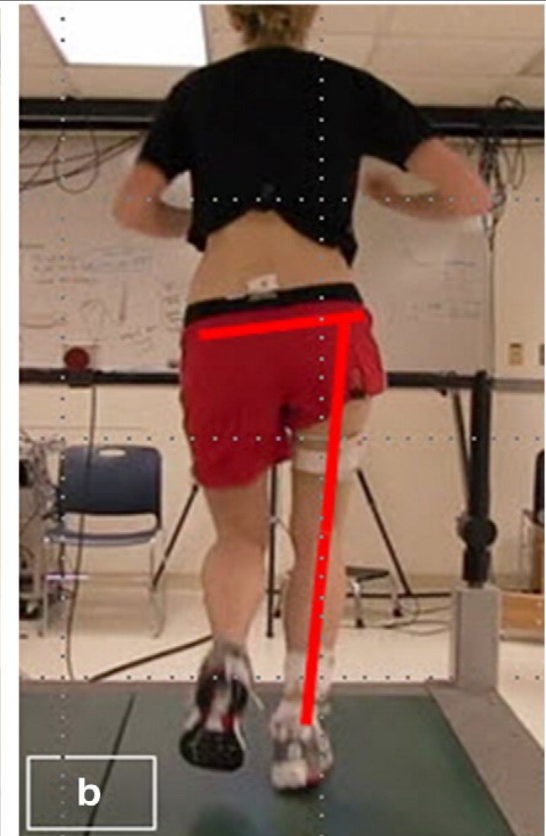
- **Foot strike pattern**
- Over-striding



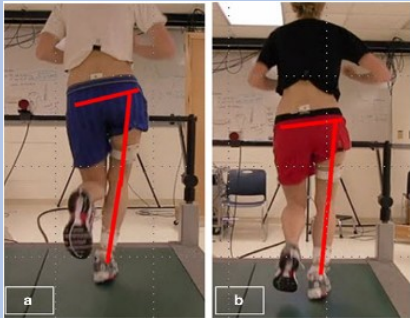
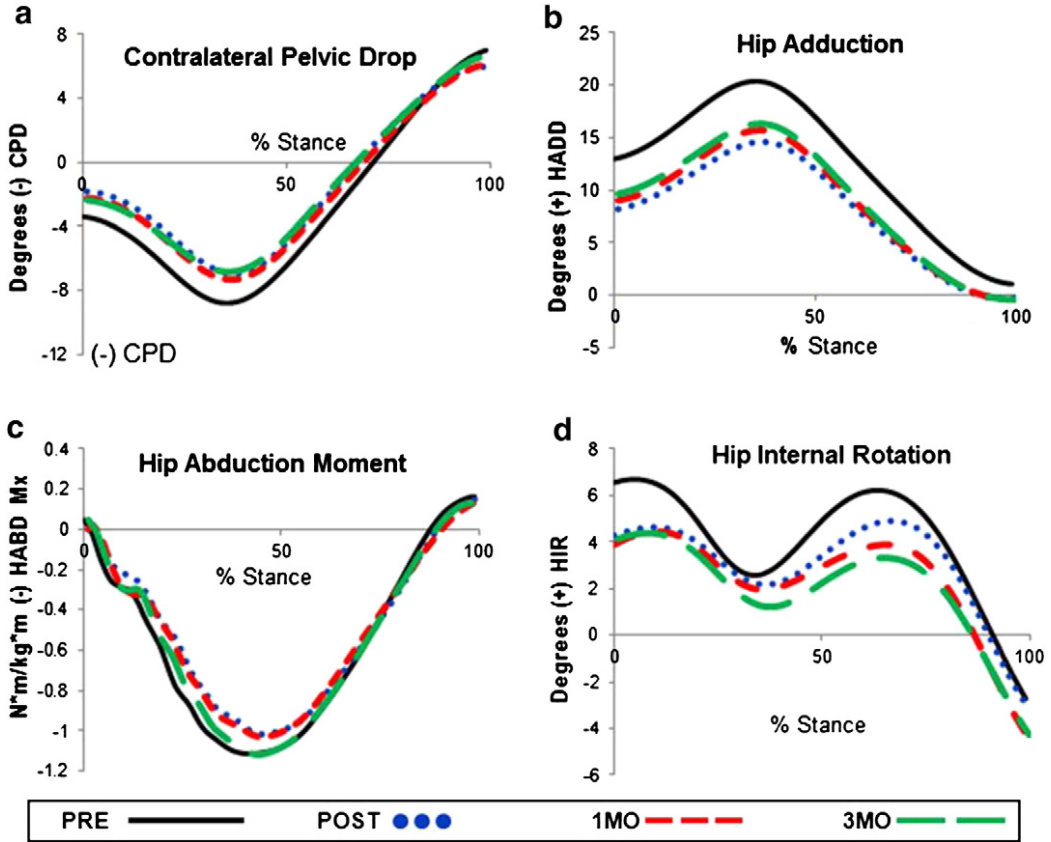
# Methodology



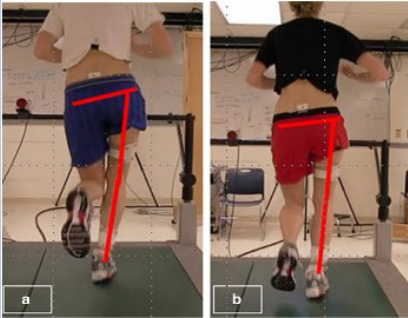
**Figure 1** Screen images seen by subjects undergoing real-time gait retraining. The grey region represents the mean ( $\pm 1$  SD) of a previously collected normal group. The subject was instructed to lower their curve to match the shaded region.



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

Evidence	Biomechanics
<p><b><u>Intervention</u></b></p> <p>8 sessions (2 weeks)</p> <p>Visual and verbal feedback to reduce hip adduction</p> <p><b><u>Outcome</u></b></p> <p>Reduce pain and improve function</p> <div data-bbox="563 901 970 1215">  </div>	 <p><b>a</b> Contralateral Pelvic Drop</p> <p><b>b</b> Hip Adduction</p> <p><b>c</b> Hip Abduction Moment</p> <p><b>d</b> Hip Internal Rotation</p> <p>Legend: PRE (solid black line), POST (dotted blue line), 1MO (dashed red line), 3MO (solid green line)</p>

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

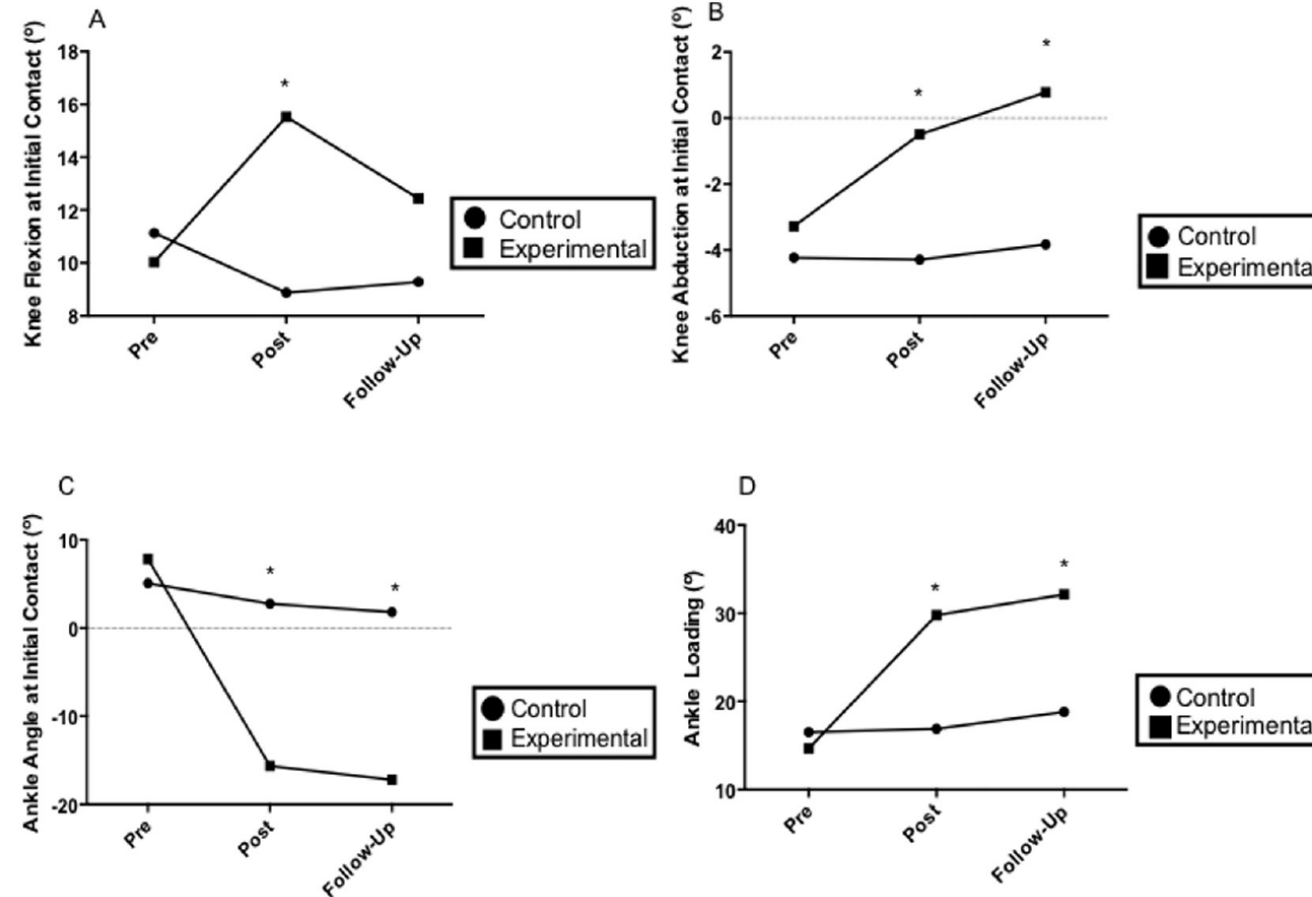
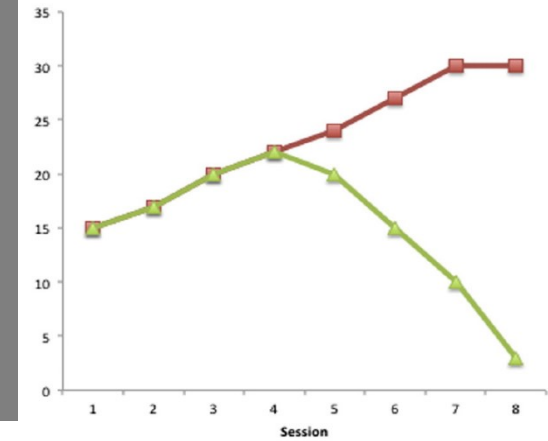
Evidence	Qualitative findings
<p><b><u>Intervention</u></b></p> <p>8 sessions (2 weeks)</p> <p>Visual and verbal feedback to reduce hip adduction</p> <p><b><u>Outcome</u></b></p> <p>Reduce pain and improve function</p> 	<p><b>Strongly advocated</b></p> <p><b>Consider step rate, hip adduction/internal rotation, trunk and pelvic position</b></p> <p><i>“Most common thing with patellofemoral would be overstriding and also medial collapse, particularly the females” (2)</i></p> <p><i>“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)</i></p> <p><i>“With patellofemoral, again we found that by changing those sagittal plane kinematics, we noticed a change in frontal plane kinematics as well” (9)</i></p>





## The effects of gait retraining in runners with patellofemoral pain: A randomized trial

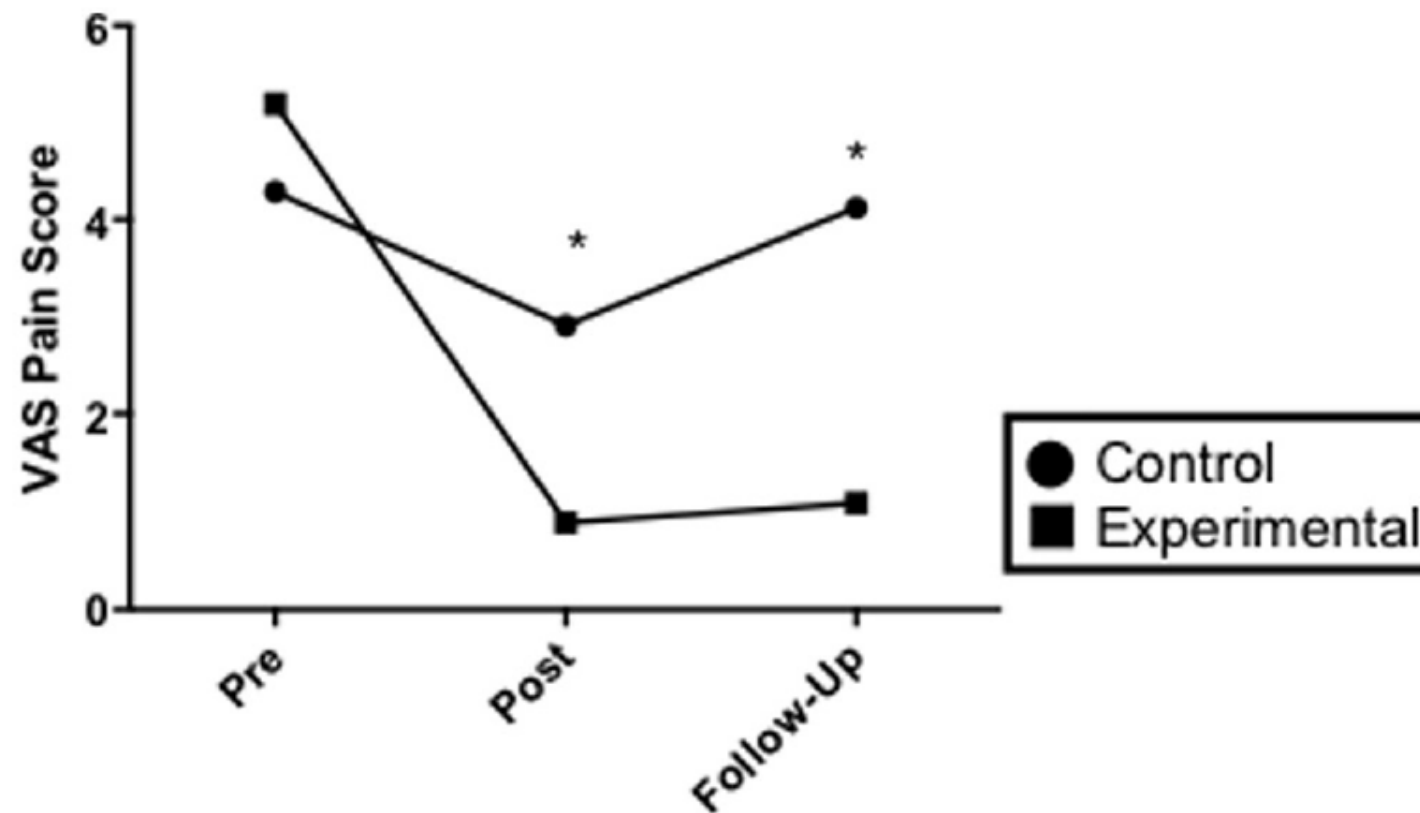
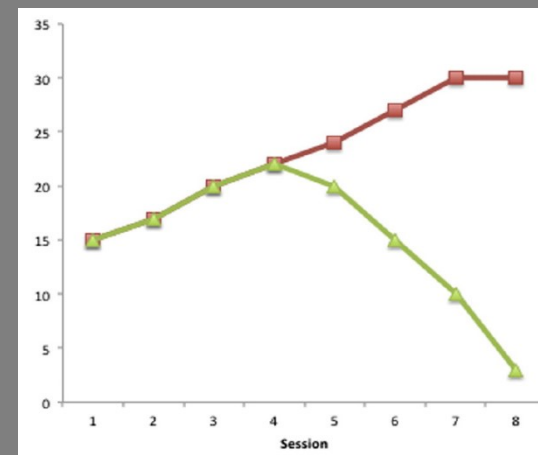
Jenevieve L. Roper<sup>a,\*</sup>, Elizabeth M. Harding<sup>a</sup>, Deborah Doerfler<sup>b</sup>, James G. Dexter<sup>b</sup>, Len Kravitz<sup>a</sup>, Janet S. Dufek<sup>c</sup>, Christine M. Mermier<sup>a</sup>





## The effects of gait retraining in runners with patellofemoral pain: A randomized trial

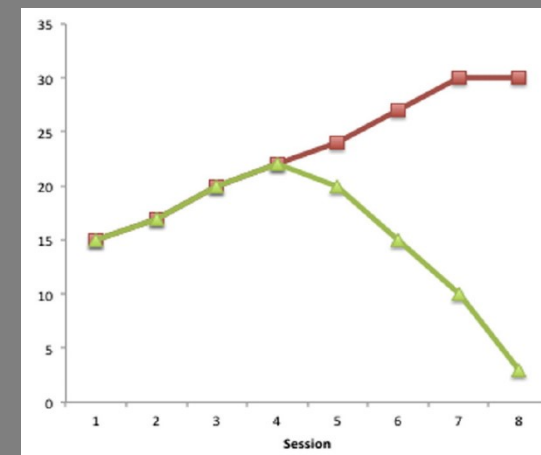
Jenevieve L. Roper<sup>a,\*</sup>, Elizabeth M. Harding<sup>a</sup>, Deborah Doerfler<sup>b</sup>, James G. Dexter<sup>b</sup>, Len Kravitz<sup>a</sup>, Janet S. Dufek<sup>c</sup>, Christine M. Mermier<sup>a</sup>





## The effects of gait retraining in runners with patellofemoral pain: A randomized trial

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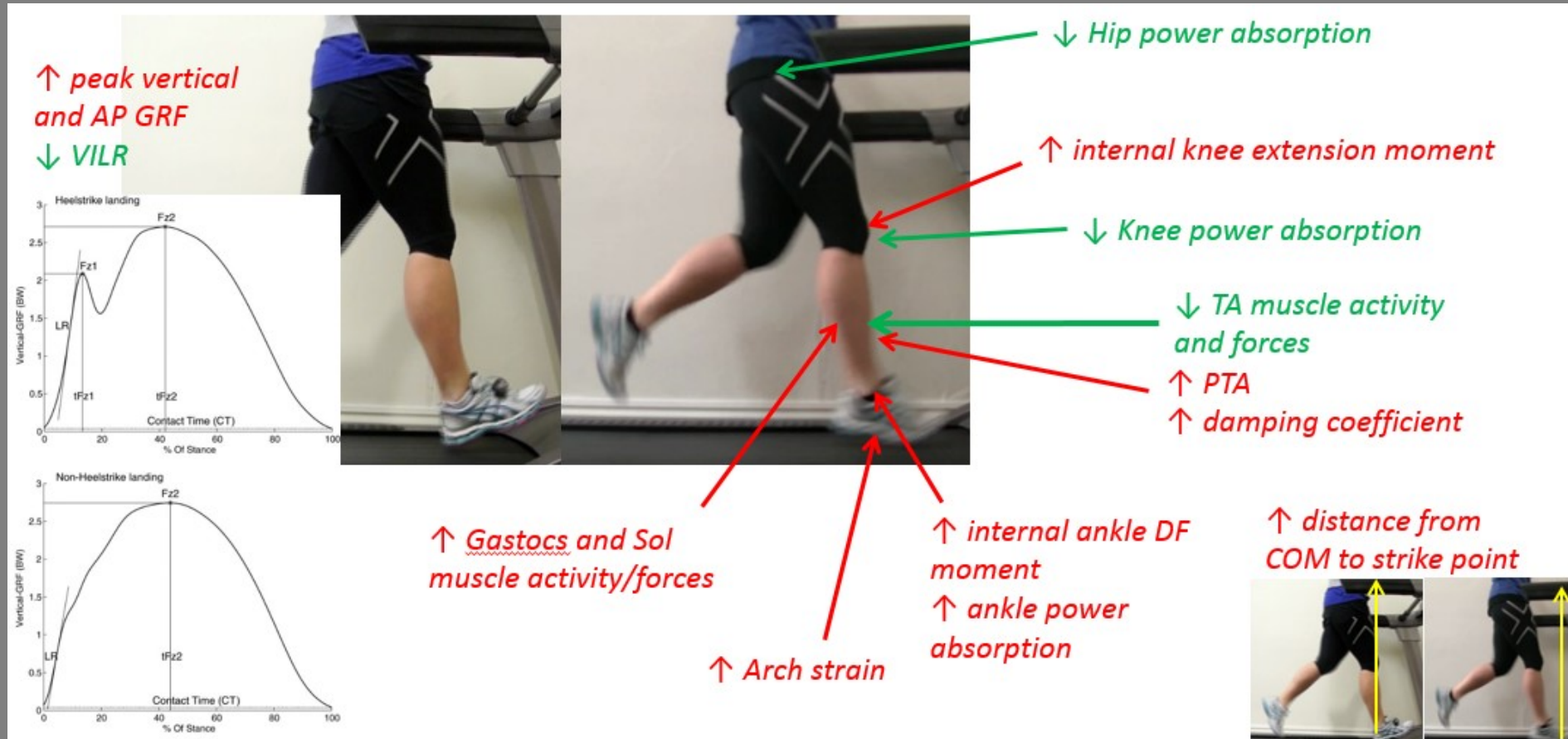
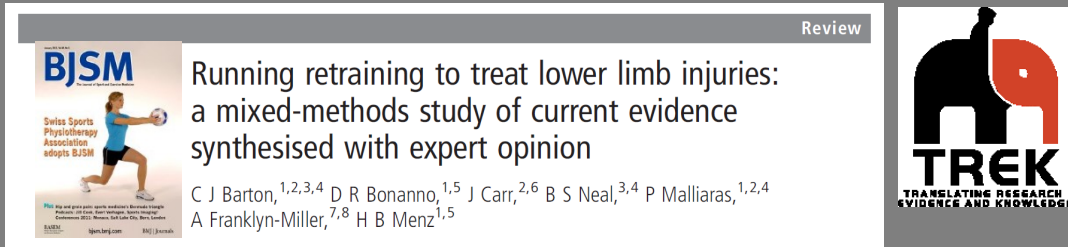
*“There were no significant adverse events that occurred in either group.”*

*“Subjects in the experimental group reported calf soreness during the retraining phase. However, this subsided by session six for all of the subjects in the group.”*

*“Two subjects in the experimental group (25%) reported ankle soreness associated with the new running gait at the one-month follow-up. Subjects described it as an ache that quickly subsided after they discontinued running.”*



# Transition from rearfoot to forefoot strike



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# Manage 'RISK' in running



Principle of 'RISK' management	General strategies
<b>R</b> educe overall load	<ul style="list-style-type: none"> <li>- Reduce running</li> <li>- Address over-stride</li> <li>- Increase step rate</li> </ul>
<b>I</b> mprove capacity to attenuate load	<ul style="list-style-type: none"> <li>- Graduated loading</li> <li>- Strength and Conditioning</li> <li>- Muscle activation cues</li> </ul>
<b>S</b> hift the load Most retraining strategies Start sagittal plane	Does the individual possess capacity?
<b>K</b> eep adapting to the capacity and goals of the runner	



# Manage 'RISK' in running

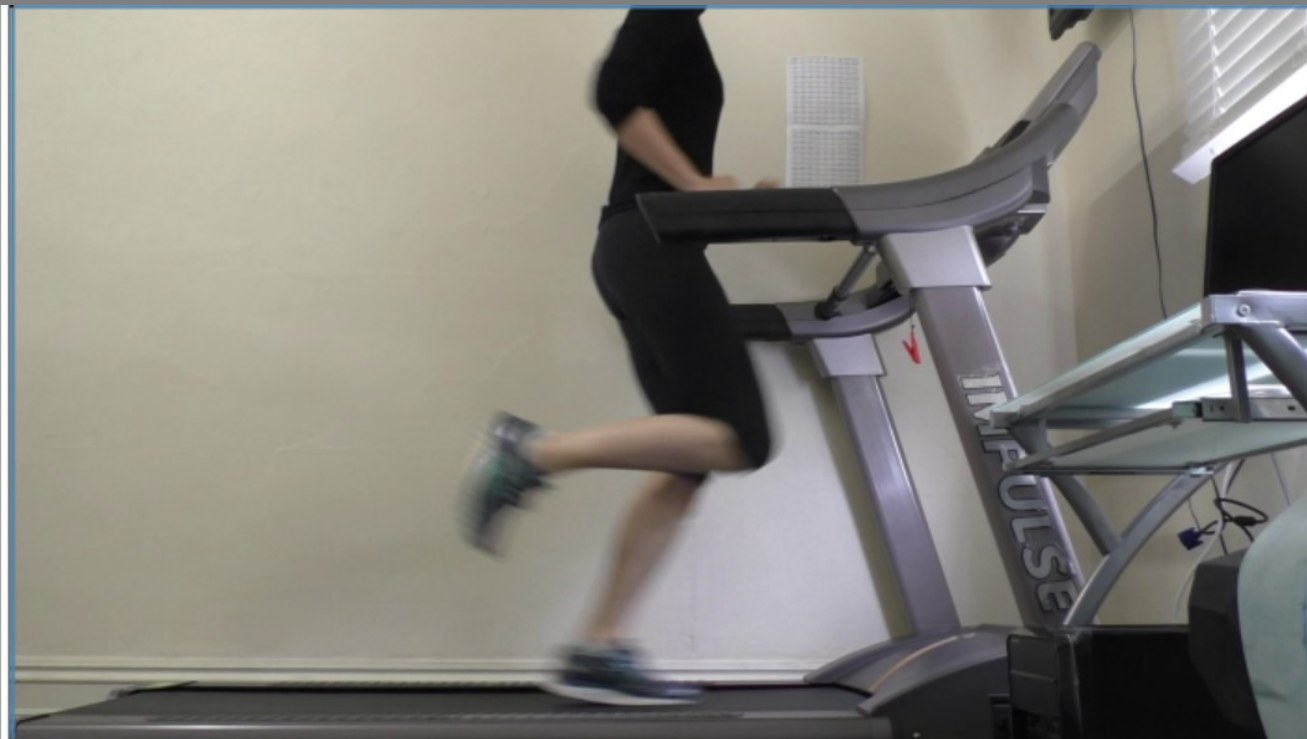


# Manage 'RISK' in running



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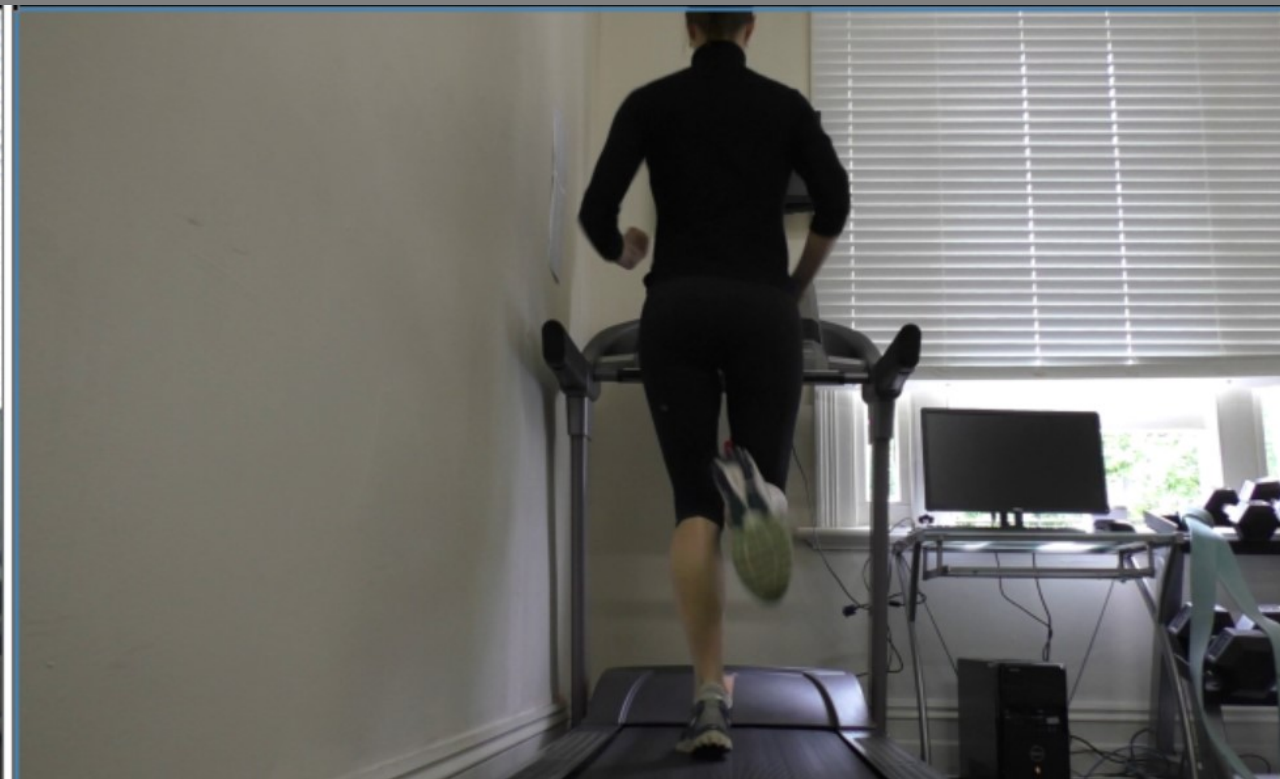
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*“Thanks again for all your help. And particularly, for swimming against the tide of voices telling me to never run again.”*

*“Since the previous MRI I’ve ran more than 2000km & three 1/2 marathons, making no difference to the condition of the knee.”*



## Clinical notes:

Assess progression of chondral and meniscal damage L knee (2014 – 2017)

## Conclusion:

Relatively stable appearances of the posterior horn medial meniscus tear, with perhaps minor progression of the degree of tear involving the posterior medial meniscal root.

Mild progression in patellofemoral chondromalacia, with increased areas of chondral fissuring.

Reduction in size of knee joint effusion and Baker's cyst.



*“My knee still hurts sometimes, but I'm not convinced I can relate it to running. It certainly doesn't like twisting motions or being slam tackled by the kids. Recently I pulled up a bit sore after a quick 9km but chose to run 18km the following day regardless and that seemed to fix the pain. Go figure.”*

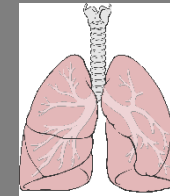
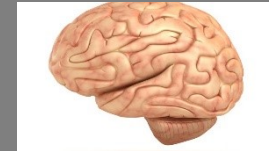




Prevent at least 35  
chronic conditions (Booth 2012)

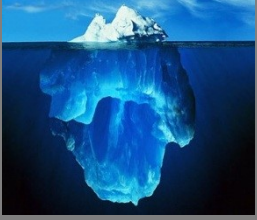
1. Pain?
2. OA progression?

RISKS



BENEFITS





# Take Home

1. Running retraining can effectively reduce risk
2. There are a lot of running
3. What is the impact of running on other structures?

Manage 'RISK' in running

Start at the ground plane first



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# ACL INJURY MANAGEMENT & OUTCOMES: A MULTI-DISCIPLINARY APPROACH SEMINAR 2017

La Trobe Sport and Exercise Medicine Research Centre

La Trobe Sport & Exercise Medicine Research Centre are proud to facilitate a two day symposium aimed at advancing **ACL injury management & outcomes through a multi-disciplinary education approach**. We have arranged a world class line up of speakers that hosts not only top talent from Victoria but also from across the globe. This line up will host sports doctors, physiotherapists, strength & conditioning coaches, psychologists, surgeons, athletes and coaches offering a unique learning experience.

## SPEAKERS INCLUDE

- Professor Kay **CROSSLEY** (Physiotherapist)
- Mr Tim **WHITEHEAD** (Orthopaedic Surgeon)
- A/Professor Kate **WEBSTER** (Psychologist)
- Dr Christian **BARTON** (Physiotherapist)
- Dr Adam **CULVENOR** (Physiotherapist)
- Ms Megan **DAVIS** (Psychologist)
- Mr Rod **WHITELEY** (Sports Physiotherapist)
- Mr Mick **HUGHES** (Physiotherapist & Exercise Physiologist)
- Ms Alanna **ANTCLIFF** (Sports Physiotherapist – Netball Australia)

## \*\*\*WHEN\*\*\*

**Friday 17<sup>th</sup> November**  
3.00PM to 7.00PM  
**Saturday 18<sup>th</sup> November**  
9.00AM to 12.30PM

## \*\*\*WHERE\*\*\*

West Lecture Theatre  
La Trobe University  
Kingsbury Drive  
Bundoora

## \*\*\*COST\*\*\*

**Early Bird (Ends October 24<sup>th</sup>)**  
\$300 – Two day attendance  
\$180 – One day attendance  
\$90 – Student

**Standard**  
\$330 – Two day attendance  
\$210 – One day attendance  
\$120 – Student

## \*\*\*REGISTER\*\*\*

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onestopweb/EvTrips/booking?e=S  
PORT\\_EV97](https://latrobe.onestopsecure.com/onestopweb/EvTrips/booking?e=S<br/>PORT_EV97)



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#LaTrobeACL

Thanks Jo!

•+ everyone else



@DrChrisBarton

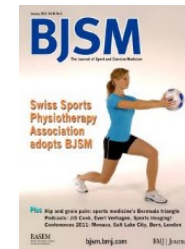




# Questions?



Review



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Physical Therapy in Sport

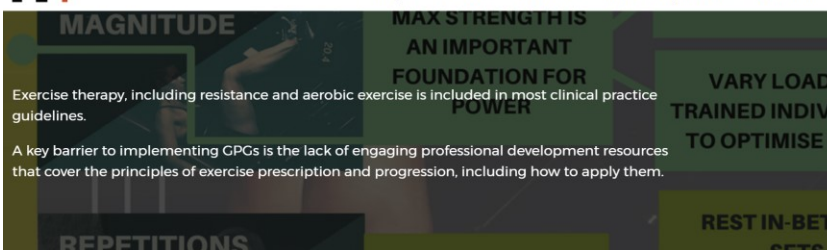
journal homepage: [www.elsevier.com/ptsp](http://www.elsevier.com/ptsp)



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



Principles Assessment Resistance Aerobic Populations Contributors



[c.barton@latrobe.edu.au](mailto:c.barton@latrobe.edu.au)