

# Managing Achilles Tendinopathy

*... formerly known as “tendinitis”*

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Certified Strength & Conditioning Specialist  
Certified USA Track & Field Level 1 Coach  
Certified USA Weightlifting Level 1 Coach



# About Me:



Conflicts of Interest:



# Objectives

- Define the relevant anatomy and diagnostic process of Achilles tendinopathy (AT)
- Identify the known risk factors of AT
- Present the current evidence-based management of AT in runners
- Q&A

- **Talk about why we get Achilles pain**
- **Talk about solutions**
- **Answer questions because it's confusing**



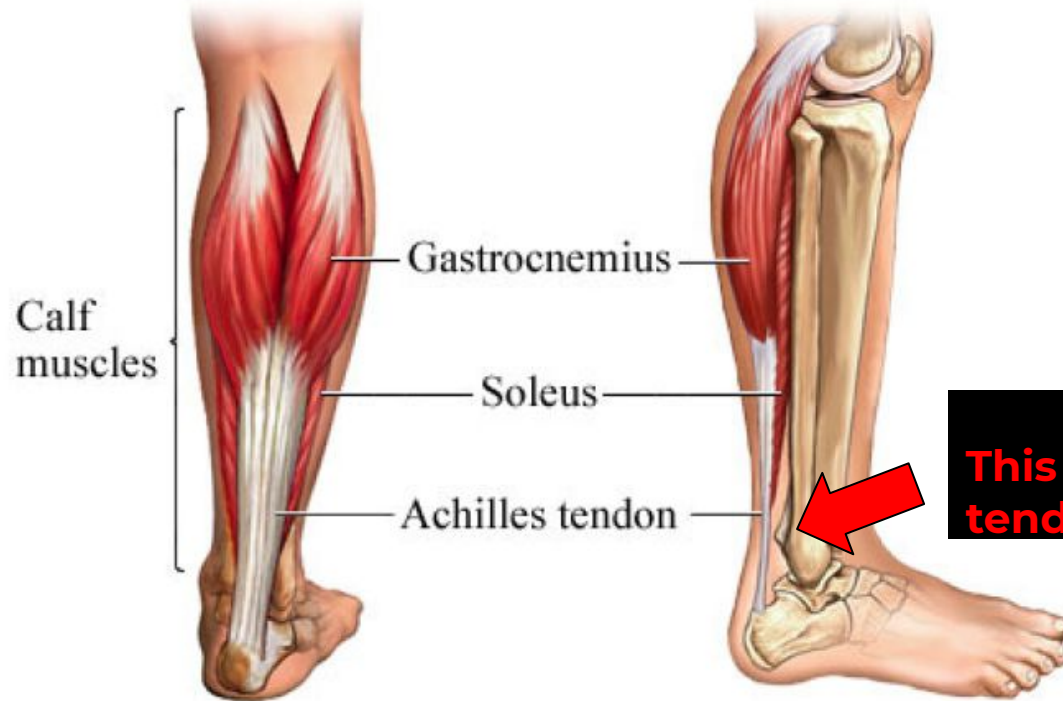
*'This tendon, if bruised or cut, causes the most acute fevers,  
induces choking, deranges the mind, and at length brings death'*  
Hippocrates



Barfod 2014



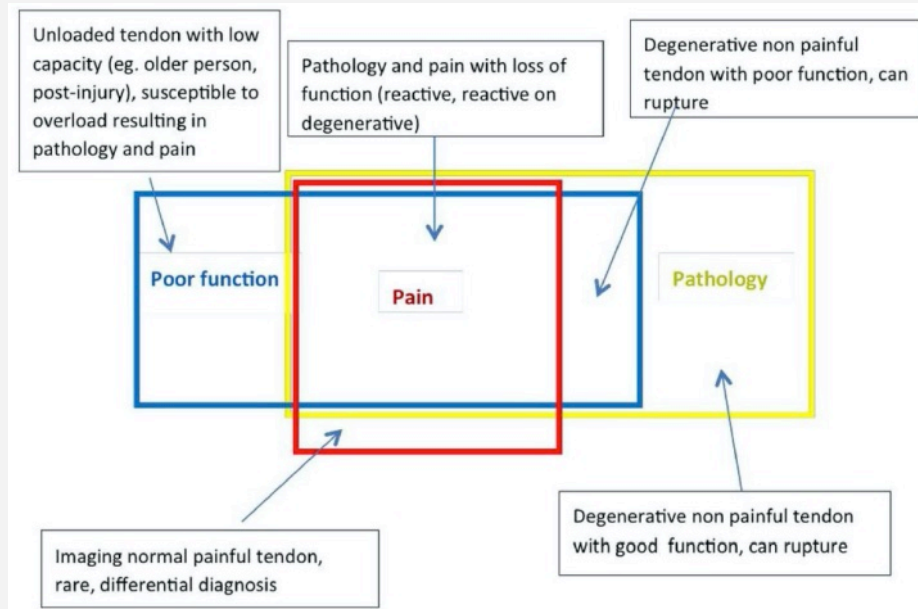
# What is the Achilles tendon?



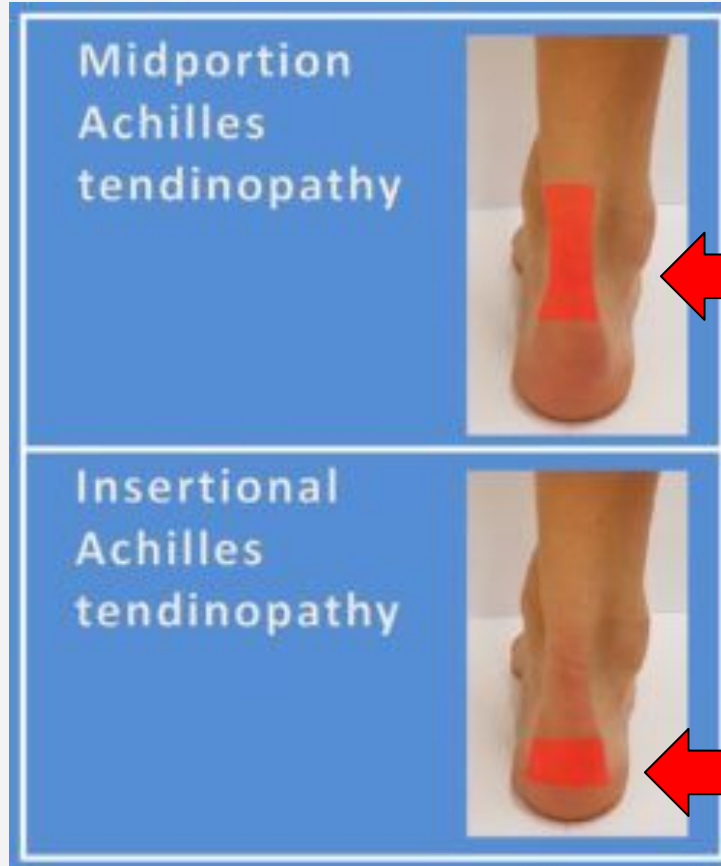
**Figure 2:** The anatomy of the Achilles tendon and the suralis muscle.

# What is tendinopathy?

**“...the clinical presentation of pain and dysfunction independent of structural pathology.”**



# Types of Achilles tendinopathy



**The middle part hurts**

**The end of it hurts**



# What ISN'T Achilles tendinopathy?

**Basically anything  
that isn't right here**



**ie Haglund's deformity,  
os trigonum, posterior  
ankle impingement  
syndrome,  
retrocalcaneal bursitis,  
Sever's disease,  
Achilles tear, calf tear...**

# Why is it so common?



## Muscle contributions to propulsion and support during running

Samuel R. Hamner<sup>1</sup>, Ajay Seth<sup>2</sup>, and Scott L. Delp<sup>1,2</sup>

<sup>1</sup>Department of Mechanical Engineering, Stanford University

<sup>2</sup>Department of Bioengineering, Stanford University

## RESEARCH ARTICLE

### Muscular strategy shift in human running: dependence of running speed on hip and ankle muscle performance

Tim W. Dorn, Anthony G. Schache and Marcus G. Pandy\*

Department of Mechanical Engineering, University of Melbourne, Victoria 3010, Australia

\*Author for correspondence to (pandym@unimelb.edu.au)

## The Proportion of Lower Limb Running Injuries by Gender, Anatomical Location and Specific Pathology: A Systematic Review

Peter Francis<sup>1</sup>, Chris Whatman<sup>2</sup>, Kelly Sheerin<sup>2</sup>, Patria Hume<sup>2</sup> and Mark I. Johnson<sup>3</sup>

<sup>1</sup> Musculoskeletal Health Research Group, School of Clinical and Applied Sciences, Leeds Beckett University, UK

<sup>2</sup> Sports Performance Research Institute New Zealand (SPRINZ), Auckland University of Technology, New Zealand

<sup>3</sup> Centre for Pain Research, School of Clinical and Applied Sciences, Leeds Beckett University, UK

# 10%(!)

(1983-2016)

# Risk factors

- Previous history of Achilles tendinopathy
- Overuse/overload
- Calf strength deficits
- High braking forces
- Training on softer surfaces
- BMI

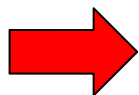
## A DELPHI STUDY OF RISK FACTORS FOR ACHILLES TENDINOPATHY- OPINIONS OF WORLD TENDON EXPERTS

Seth O'Neill, MSc, BSc, PGCE HE, MSCP, MACP<sup>1</sup>  
Paul J. Watson, PhD, PGCE HE, FCSP<sup>2</sup>  
Simon Barry, PhD, PGCE HE, MCSP<sup>1</sup>



# Load vs. Capacity

**The amount of force  
your ~~kneecap~~  
Achilles tolerates  
until it doesn't**



Capacity

Load



**Force through your ~~kneecap~~  
Achilles via running, walking,  
negotiating stairs, etc.**

## REVIEW ARTICLE

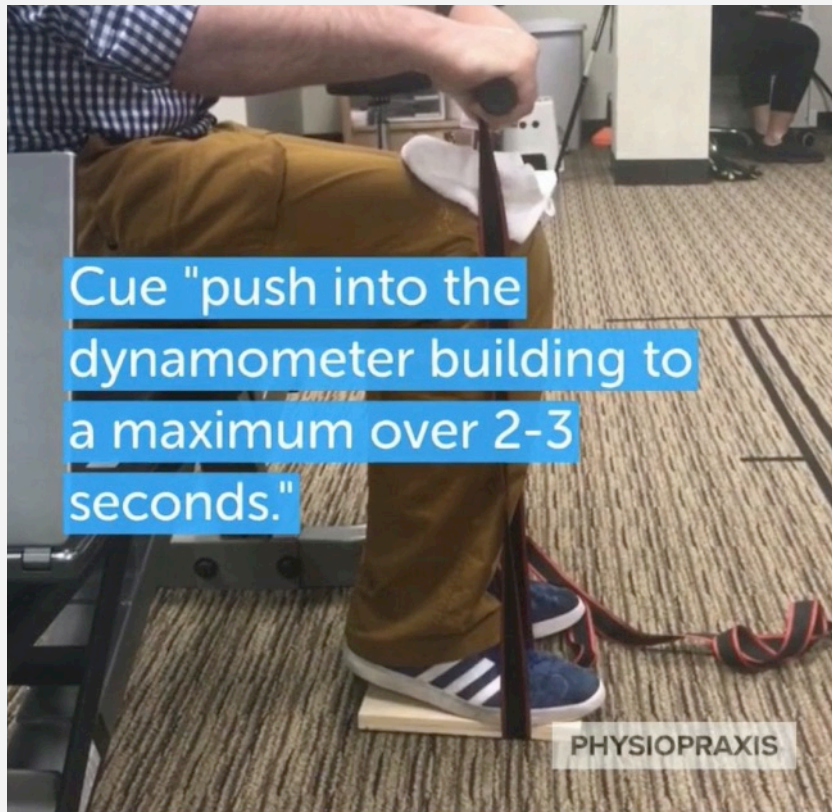
### A framework for the etiology of running-related injuries

M. L. Bertelsen<sup>1</sup> | A. Hulme<sup>2</sup> | J. Petersen<sup>1</sup> | R. K. Brund<sup>3</sup> |  
H. Sørensen<sup>1</sup> | C. F. Finch<sup>2</sup> | E. T. Parner<sup>4</sup> | R. O. Nielsen<sup>1</sup>

# Calf Strength Deficits

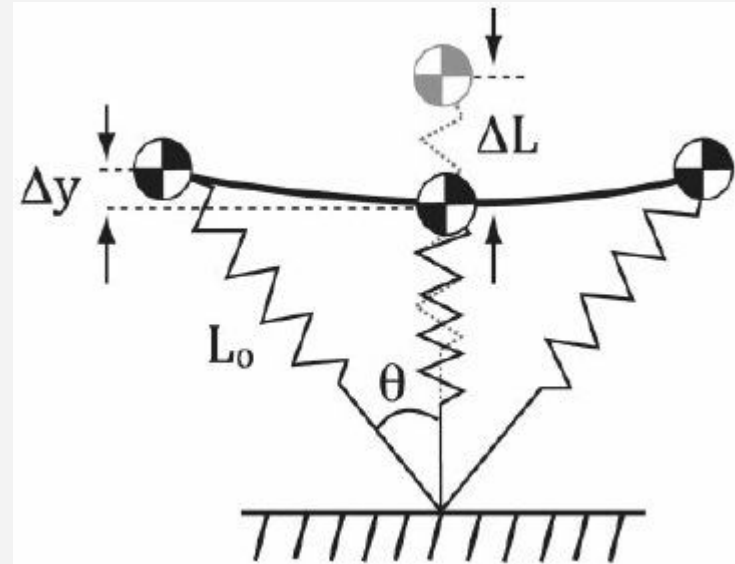
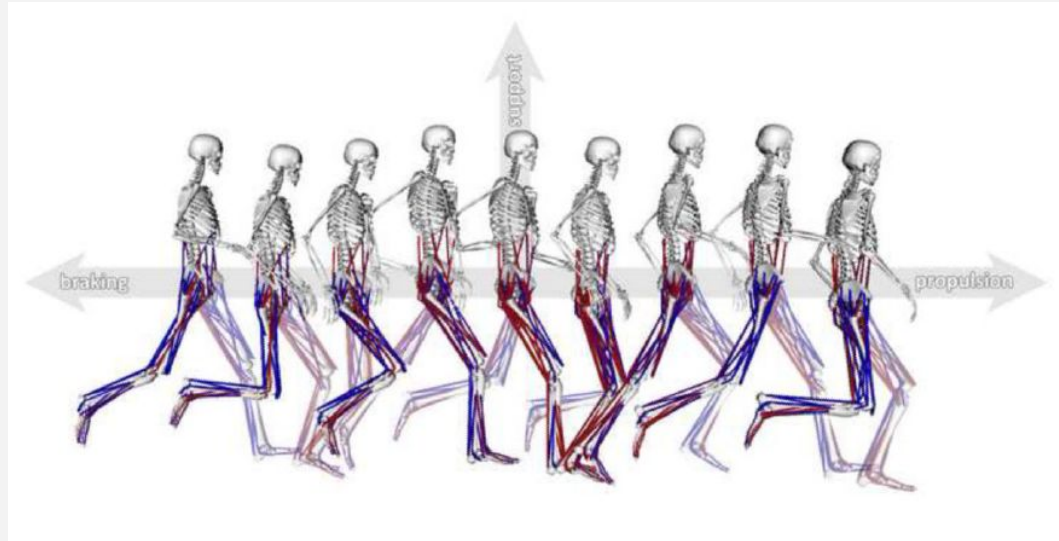
Plantarflexor strength and endurance deficits associated with mid-portion Achilles tendinopathy: The role of Soleus

Dr Seth O'Neill, (PT, PHD)<sup>1</sup>; Dr Simon. Barry, (PT, PHD)<sup>1</sup>; Professor Paul Watson, (PT, PHD)<sup>2</sup>





# Running Biomechanics



# Shoes????

Can the “Appropriate” Footwear Prevent Injury in Leisure-Time Running? Evidence Versus Beliefs

Laurent Malisoux, PhD\*; Daniel Theisen, PhD†

- **Minimalist shoe typically shifts loads to foot/ankle**
- **Heel-toe drop seems to matter less than overall cushioning**
- **No causative relationship with Achilles tendinopathy**



# Treatment Strategies

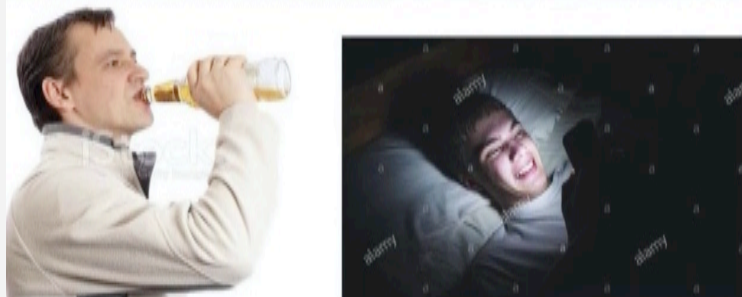
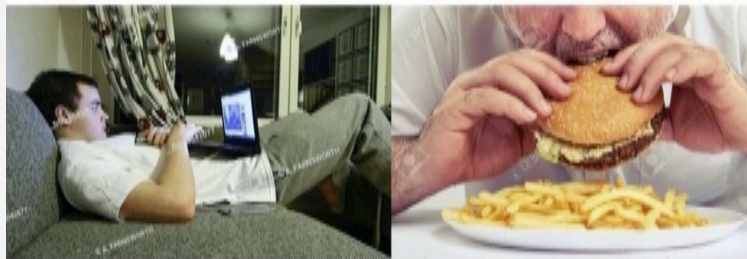
1. **Training load modifications**
2. **Gait Retraining**
3. **Resistance Training**
4. **Plyometric Training**

**Educating the runner on what to expect, developing a good client-provider relationship, talking about running and stuff**



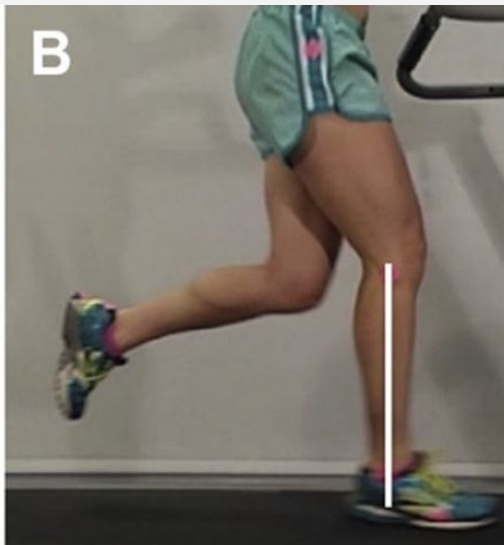
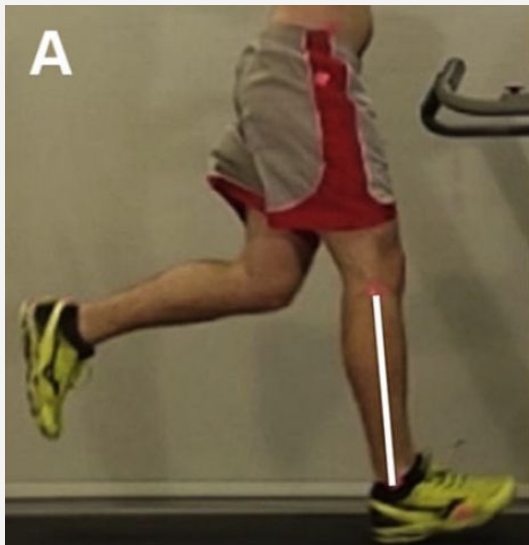
# Training Load Modifications

Me: "I feel terrible on this run. I don't understand."  
Also me last night:



- **Decrease intensity**
- **Flat, firm training surfaces**
- **Increase recovery between runs**
- **Decrease total volume**

# Gait Retraining / Running Biomechanics



CHRISTOPHER NAPIER, PT, PhD<sup>1,2</sup> • CHRISTOPHER L. MACLEAN, PhD<sup>1,2</sup> • JESSICA MAURER, MSc<sup>2</sup>  
JACK E. TAUNTON, MD<sup>1,2</sup> • MICHAEL A. HUNT, PT, PhD<sup>1</sup>

Souza 2016

Real-Time Biofeedback of  
Performance to Reduce Braking Forces  
Associated With Running-Related  
Injury: An Exploratory Study



# Resistance Training

**Heavy Slow Resistance Versus Eccentric Training as Treatment for Achilles Tendinopathy: A Randomized Controlled Trial**  
Rikke Beyer, Mads Kongsgaard, Birgitte Hougs Kjær, Tommy Øhlenschläger, Michael Kjær and S. Peter Magnusson  
*Am J Sports Med* 2015 43: 1704 originally published online May 27, 2015  
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# How to Movement

A Sports Physical Therapy Blog

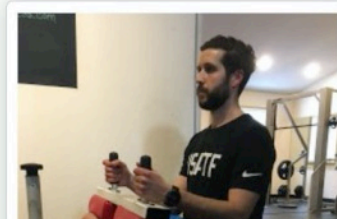
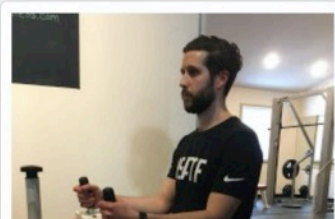
Wednesday, March 4, 2020

## The Best Ways to Strengthen the Calf Because I'm Tired of Sending My Clients YouTube Links

Here are the ways to effectively load the calf.

#1) With the knee bent to target the soleus:

⇒ You could use the machine that was built for it. Load it up.



<https://howtomovementblog.blogspot.com/2020/03/the-best-ways-to-strengthen-calf.html>



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**Typical heavy slow resistance protocol (3x/week):**

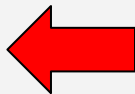
**Week 1: 3x15**

**Week 2-3: 3x12**

**Week 4-5: 4x10**

**Week 6-8: 4x8**

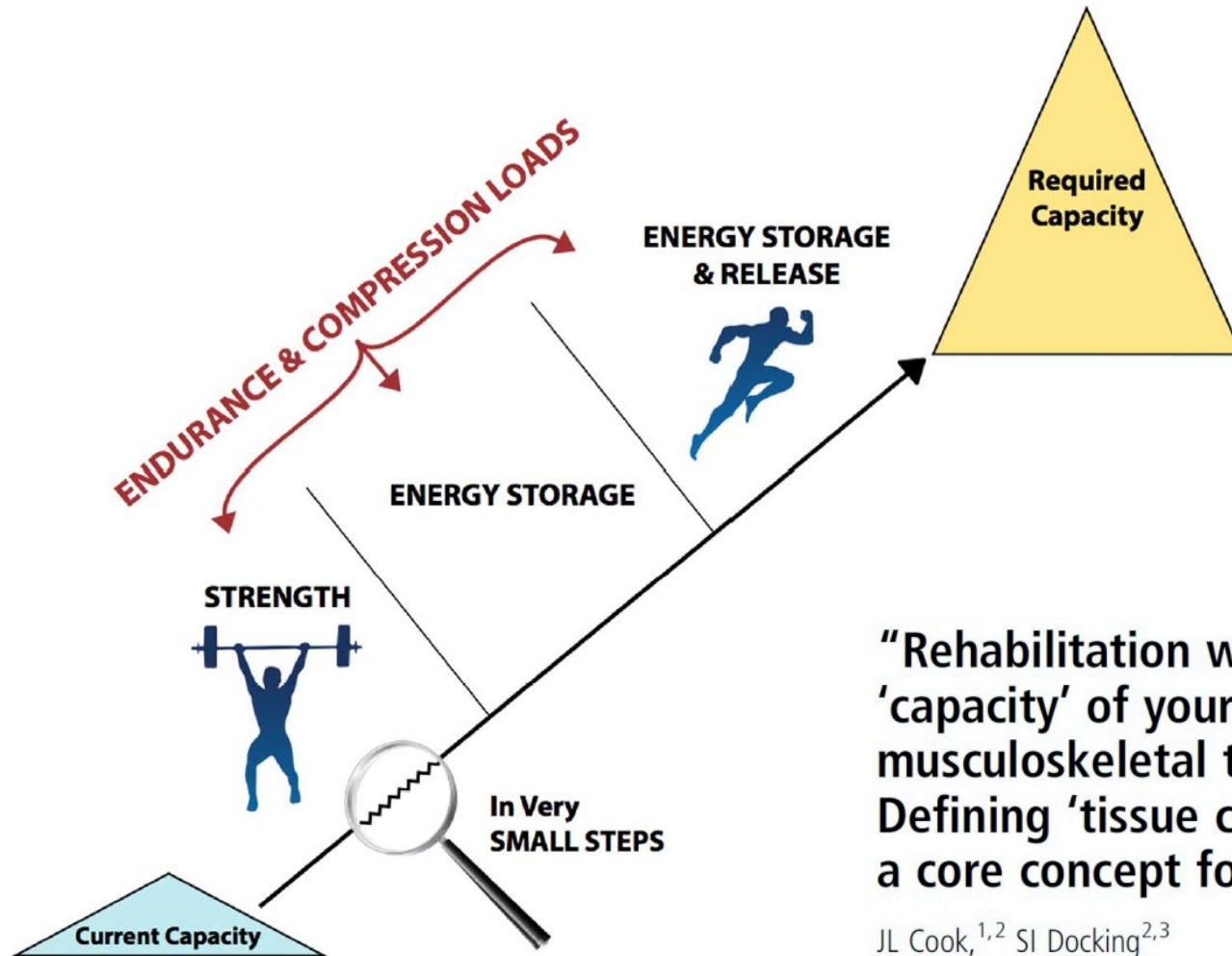
**Week 9+: 4x6**



**This number determines  
the weight that you use**







**"Rehabilitation will increase the 'capacity' of your ...insert musculoskeletal tissue here...."**  
**Defining 'tissue capacity':**  
**a core concept for clinicians**

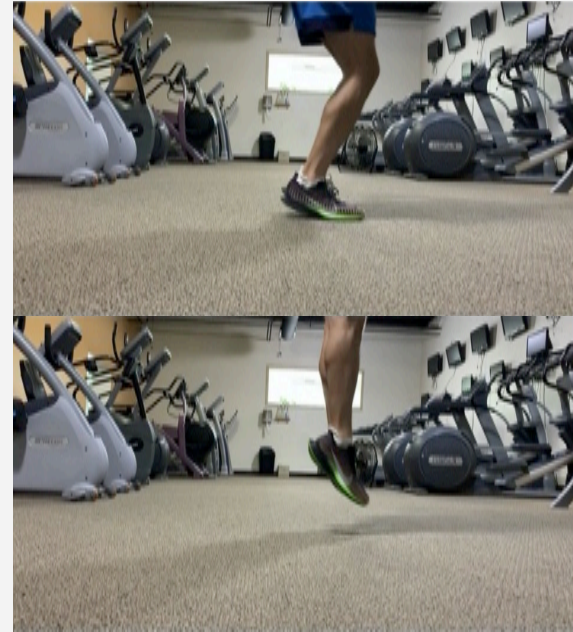
JL Cook,<sup>1,2</sup> SI Docking<sup>2,3</sup>



# Plyometric Training

Education and exercise supplemented by a pain-guided hopping intervention for male recreational runners with midportion Achilles tendinopathy: a single cohort feasibility study

Igor Sancho<sup>1</sup>, Dylan Morrissey<sup>1,2</sup>, Richard W. Willy<sup>3</sup>, Christian Barton<sup>1,4,5</sup>, Peter Malliaras<sup>1,6</sup>



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<b>LEVEL 1</b> Pain > 3/10 NRS	<b>ISOMETRICS</b> (daily) Isometric seated heel raises 3/day, 5 x 45" x BW			
<b>LEVEL 2</b> Pain < 3/10 NRS Exercises ok	<b>ISOMETRICS</b> (daily) Isometric seated heel raises 3/day, 5 x 45" x BW	<b>ISOTONICS</b> (3 x week) Standing heel raises (2 x 25 reps) Seated heel raises (3 x 8 x 80%6RM) Hip abduction (individually tailored) Hip extension (individually tailored)		
<b>LEVEL 3</b> Pain < 3/10 NRS 20 DL jumps ok	<b>ISOMETRICS</b> (daily) Isometric seated heel raises 3/day, 5 x 45" x BW	<b>ISOTONICS</b> (3 x week) Standing heel raises (2 x 25 reps) Seated heel raises (3 x 8 x 80%6RM) Hip abduction (individually tailored) Hip extension (individually tailored)	<b>DL JUMPS</b> (3 x week) 3 x 60 DL 3 x 30 DL stiff knee 3 x 5 DL forward/back 3 x 5 DL onto a step	
<b>LEVEL 4</b> Pain < 3/10 NRS 10 SL hops ok	<b>ISOMETRICS</b> (daily) Isometric seated heel raises 3/day, 5 x 45" x BW	<b>ISOTONICS</b> (3 x week) Standing heel raises (2 x 25 reps) Seated heel raises (3 x 8 x 80%6RM) Hip abduction (individually tailored) Hip extension (individually tailored)	<b>6L HOPS</b> (1 x week) 3 x 60 DL(warm up) 3 x 30 SL 3 x 15 SL stiff knee 3 x 5 SL forward/back 3 x 10 SL onto a step	<b>RUN</b> (2 x week) Warm up: 3 x 20 DL jumps + 1 x 10 SL hops Run in relation to personal history, time injured and actual condition Cues: high cadence, easy pace, 10% max volume increase / week

Abbreviations: NRS numeric rating scale, BW bodyweight, reps repetitions, RM repetition maximum, DL double leg, SL single leg, max maximum

# Remember the traffic light!!!

## How Should I Exercise With Symptoms?

Let's say you've seen a healthcare practitioner and have been diagnosed with a condition that responds well to exercise. It's not always so simple, especially when you're still feeling symptoms. How can you effectively manage your symptoms while still being as active as possible?

## The Exercise Traffic Light

The Exercise Traffic Light is a decision-making tool to help you figure out what might be too much, too little, or just the right amount when exercising with symptoms. This tool should be used to assess symptom response during and up to 24 hours post-exercise. Here's how it works:



## The Red Light

Your symptoms have gradually increased during exercise and are now escalating or above "tolerable." Try decreasing one or more of these variables:

- Resistance
- Volume (sets, repetitions)
- Speed
- Range of motion

Re-assess your symptoms post-exercise. If it's no worse off in the next 24 hours, you have effectively managed your symptoms.

## The Yellow Light

Your symptoms are present, but they aren't increasing. As time passes, symptoms stay stable. Continue with the current exercise prescription.

Re-assess your symptoms post-exercise.

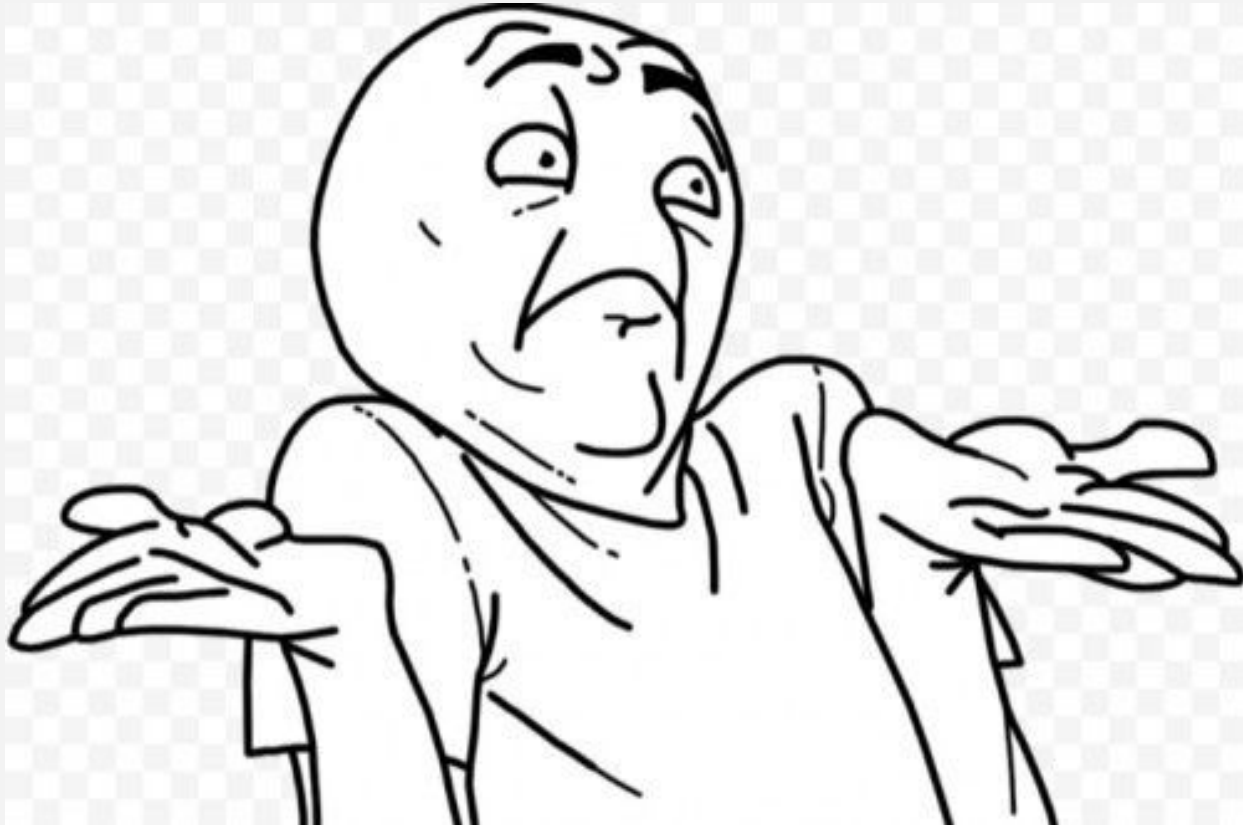
## The Green Light

Your symptoms have gradually decreased during exercise. What more could you ask for?! Continue with the current exercise prescription OR consider increasing one of these variables (if applicable towards target goal):

- Resistance
- Volume (sets, repetitions)
- Speed
- Range of motion

Re-assess your symptoms post-exercise.

# Prevention Strategies



# THE LIST



1a. Listen to your body

1b. Manage previous injuries

1c. Avoid frequent spikes in training

1d. Select a sustainable training plan



Prevention Strategy: Stay Strong

...and explosive

# 1. Calves

2. All of the other running muscles



# Take Home Points

- Achilles tendinopathy can significantly impact running and last for a long time
- Main risk factors are some combination of training error, muscle strength deficits, and possible biomechanical contributors
- We might not be doing a great job at “finishing the rehab”
  - Resistance training should be heavy, progressive
  - Don't forget plyometrics
- Prevention?
  - Stay strong and try to limit bad training decisions



# Q&A



# References

1. Barfod KW. Achilles tendon rupture; assessment of nonoperative treatment. *Dan Med J*. 2014;61(4):B4837.
2. Cook JL, Rio E, Purdam CR, Docking SI. Revisiting the continuum model of tendon pathology: what is its merit in clinical practice and research? *Br J Sports Med*. 2016;50(19):1187-1191.
3. Scott A, Backman LJ, Speed C. Tendinopathy: update on pathophysiology. *J Orthop Sports Phys Ther*. 2015;45(11):833-841.
4. <https://blogs.bmj.com/bjism/2020/08/10/which-treatment-is-most-effective-for-achilles-tendinopathy-a-new-way-of-finding-out/>
5. Hamner SR, Seth A, Delp SL. Muscle contributions to propulsion and support during running. *J Biomech*. 2010; 43(14): 2709-16.
6. Dorn TW, Schache AG, Pandy MG. Muscular strategy shift in human running: dependence of running speed on hip and ankle muscle performance. *J Exp Biol*. 2012; 215 (Pt 11): 1944-56.
7. Francis P, Whatman C, Sheerin K, Hume P, Johnson MI. The proportion of lower limb running injuries by gender, anatomical location and specific pathology: a systematic review. *J Sports Sci Med*. 2019;18(1):21-31.
8. Lorimer AV, Hume PA. Achilles tendon injury risk factors associated with running. *Sports Med*. 2014;44(10):1459-1472.
9. O'Neill S, Watson PJ, Barry S. A delphi study of risk factors for achilles tendinopathy- opinions of world tendon experts. *Int J Sports Phys Ther*. 2016;11(5):684-697.
10. Bertelsen ML, Hulme A, Petersen J, et al. A framework for the etiology of running-related injuries. *Scand J Med Sci Sports*. 2017;27(11):1170-1180.
11. O'Neill S, Barry S, Watson P. Plantarflexor strength and endurance deficits associated with mid-portion Achilles tendinopathy: The role of soleus. *Phys Ther Sport*. 2019;37:69-76.
12. Arellano CJ, Kram R. Partitioning the metabolic cost of human running: a task-by-task approach. *Integr Comp Biol*. 2014;54(6):1084-1098.
13. Malisoux L, Theisen D. Can the “appropriate” footwear prevent injury in leisure-time running? Evidence versus beliefs. *J Athl Train*. Published online October 16, 2020.
14. Souza RB. An evidence-based videotaped running biomechanics analysis. *Phys Med Rehabil Clin N Am*. 2016;27(1):217-236.
15. Napier C, Cochrane CK, Taunton JE, Hunt MA. Gait modifications to change lower extremity gait biomechanics in runners: a systematic review. *Br J Sports Med*. 2015;49(21):1382-1388.
16. Beyer R, Kongsgaard M, Hougs Kjær B, Øhlenschläger T, Kjær M, Magnusson SP. Heavy slow resistance versus eccentric training as treatment for achilles tendinopathy: a randomized controlled trial. *Am J Sports Med*. 2015;43(7):1704-1711.
17. Cook JL, Docking SI. “Rehabilitation will increase the ‘capacity’ of your ...insert musculoskeletal tissue here....” Defining ‘tissue capacity’: a core concept for clinicians. *Br J Sports Med*. 2015;49(23):1484-1485.
18. Sancho I, Morrissey D, Willy RW, Barton C, Malliaras P. Education and exercise supplemented by a pain-guided hopping intervention for male recreational runners with midportion Achilles tendinopathy: A single cohort feasibility study. *Phys Ther Sport*. 2019;40:107-116.

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