

Workload

Weeks

Beyer 2015

Hensley 2012

Helping the runner with Achilles tendinopathy return to running

Rich Willy, MPT, PhD
School of Physical Therapy and Movement Science
University of Montana

UNIVERSITY OF MONTANA

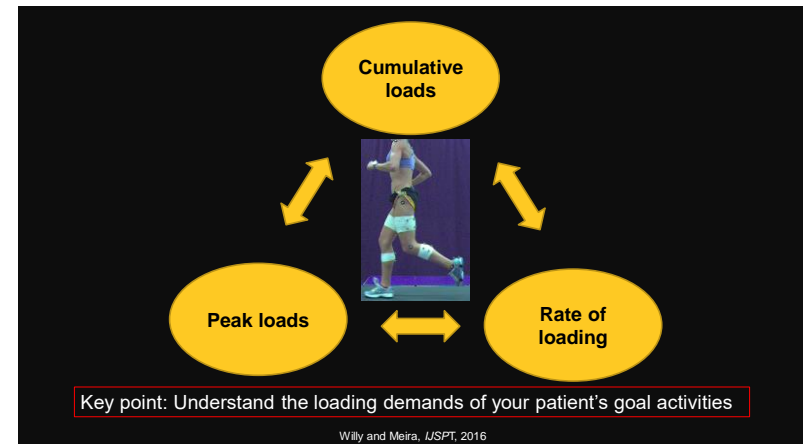
University of Montana Movement Science Laboratory

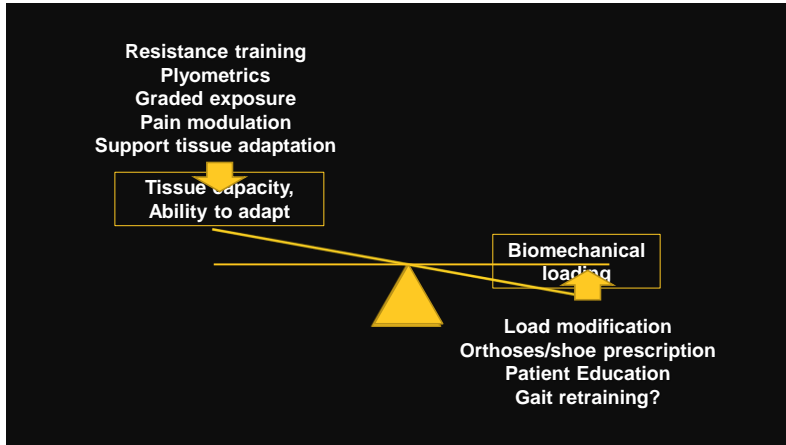
Disclosures

I have no product endorsements or other financial relationships to disclose

Outline

- Strategies to consider for return to run
- How to reduce load, how to add load
- Multi-faceted return to running program
- Recommendations for running surfaces and shoe modifications





QUIZ!

At what phase of the running cycle are Achilles tendon loads the greatest?

1. Swing phase
2. Impact phase: load absorption phase
3. Midstance: peak dorsiflexion
4. Propulsive phase: peak plantarflexion achieved



Ways to reduce Achilles Tendon loads

Heel lift

Heel lift 9-12mm
(moderate evidence)

High drop shoe

27 mm heel } 10 mm drop
17 mm forefoot }

Rocker bottom shoe

13% Lower Achilles tendon loads
Sobhani 2013, 2015

When a shoe matters

33° Dorsiflexion

26° Dorsiflexion

0mm heel-toe drop

8mm heel-toe drop

Altra Olympus Runningwarehouse.com

Saucony Excursion TR Saucony.com

Best training practices & Address psychosocial factors e.g., pain beliefs

Patient education

Tolerance to high tissue loads

Heavy resistance training

Adjuncts

Energy storage/release

Cumulative loads

Return to running - Graded return

Silbernagel and Crossley, JOSPT 2015

Heavy resistance training phase

6-9 Bodyweights Achilles tendon force per step!
Even more for the downhill or Forefoot runner

Go heavy in the gym!

Patient education: Achilles Tendinopathy

Kinesiophobia affects outcomes Silbernagel 2010

Research Article
The Risk of Achilles Tendon Rupture in the Patients with Achilles Tendinopathy: Healthcare Database Analysis in the United States
Yusui Y, Yasui J, Uehara T, Tomogai S, Andrew J, Rosenbaum J, Yoshitani S, Kawanishi T, Hiyatake K, Kawanishi G, Kawanishi K

Only 4% of individuals w/ Achilles tendon rupture had previous tendinopathy! Yasui 2017

MONITORING PAIN AND LOAD RESPONSE

Pain during exercise
0 = no pain 10 = worse pain imaginable

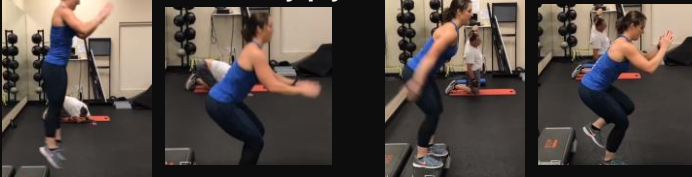
0 - 2	4 - 5	6 - 10
Safe zone	Acceptable	Excessive

Adapted from Thomee (1997) and Silbernagel (2007)

Monitor symptom response for 24-48 hours post exercise
Pain should settle quickly post exercise with no increase in symptoms on DMS the next day

No detrimental effect on recovery if allowed up to 5/10 pain Thomee 1997, Silbernagel 2007

Why plyometrics?



Layers on the rate of energy storage and release with the high peak loads, without the cumulative loads of running

When to add?

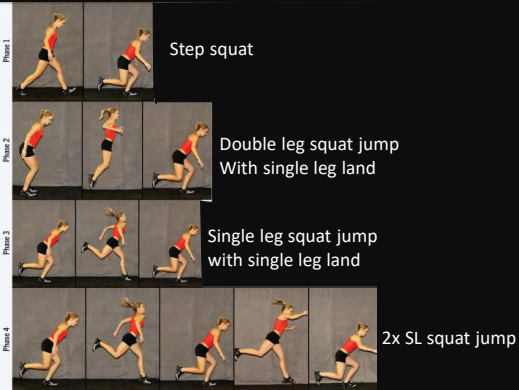
- Easily doing single leg heel raise with 20% of BW, 3 sets of 8
- Runner appears to be plateauing with strength training

Lower leg loading program Stage 3-Stage 4

Target Achilles tendon and triceps surae



Full plyometric program in workshop



Recommended Program

1 set of 10

↓

2 sets of 10

↓

3 sets of 10

↓

Progress to next Phase

Di Stasi 2013

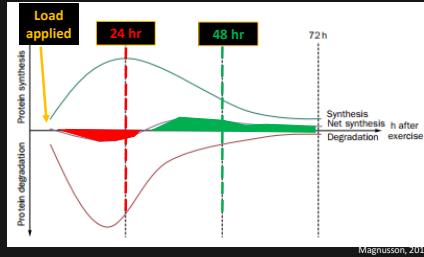
Sample return to running program: graded exposure

Wk	Mon	Tue	Wed	Thur	Fri	Sat	Sun
1	5' walk warmup (w/u) 21 minutes: Alternating 2 min walk, 1 min run, 4' walk cool down (c/d)	X-train	5' w/u, 21 minutes: Alternating 2 min walk, 1 min run, 4' c/d	X-train	5' w/u, 21 minutes: Alternating 2 min walk, 1 min run, 4' c/d	X-train	X-train
2	5' w/u, 21 minutes: Alternating 1.5 min walk, 1.5 min run, 4' c/d	X-train	5' w/u, 21 minutes: Alternating 1.5 min walk, 1.5 min run, 4' c/d	X-train	5' w/u, 21 minutes: Alternating 1.5 min walk, 1.5 min run, 4' c/d	X-train	X-train
3	5' w/u, 28 minutes: Alternating 1 min walk, 2 min run, 4' c/d	X-train	5' w/u, 28 minutes: Alternating 1 min walk, 2 min run, 4' c/d	X-train	5' w/u, 28 minutes: Alternating 1 min walk, 2 min run, 4' c/d	X-train	X-train
4	5' w/u, 28 minutes: Alternating 1 min walk, 3 min run, 4' c/d	X-train	5' w/u, 28 minutes: Alternating 1 min walk, 3 min run, 4' c/d	X-train	5' w/u, 30 minutes: Alternating 1 min walk, 5 min run, 4' c/d	X-train	X-train
5	5' w/u, 30 minutes: Alternating 1 min walk, 5 min run, 4' c/d	X-train	5' w/u, 30 minutes: Alternating 2 min walk, 8 min run, 4' c/d	X-train	5' w/u, 30 minutes: Alternating 1 min walk, 9 min run, 4' c/d	X-train	X-train
6	5' w/u, 33 minutes: 2x 15' run, 3' walk, 4' c/d	X-train	5' w/u, 33 minutes: 2x 15' run, 3' walk, 4' c/d	X-train	5' w/u, 33 minutes: 2x 15' run, 3' walk, 4' c/d	X-train	X-train

X-Train options: walking, cycling, elliptical, nordic skiing

Perform resistance training on running days

Collagen degradation/synthesis balance: Implications for injury and rehabilitation

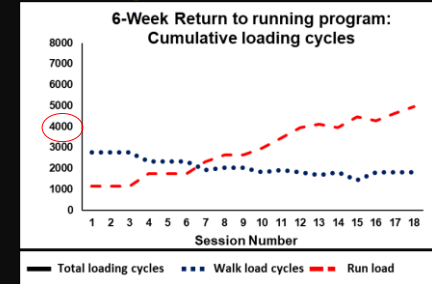


Balance maintained => tendon hypertrophy over time Couppe 2008, Kovanen 1989
 Too much load/too frequently, not enough time for adaptation => injury Arnocky, 2007

Key Point: Assess pain 24 hours after loading to assess response!

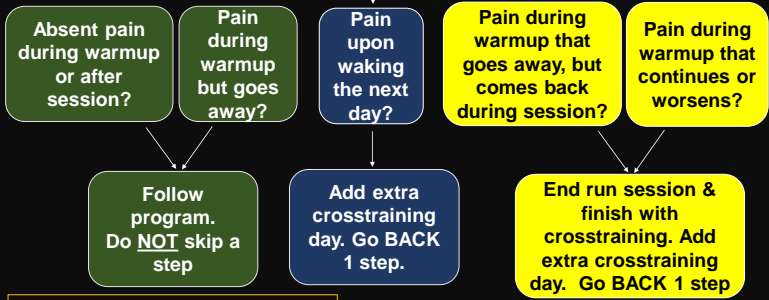
Return to running programs: Cumulative load exposure Willy and Meira 2016

Sample runner (assumptions):
 Walking cadence: 118 SPM
 Running cadence: 178 SPM



Recommendation:
 Use wearable to ensure your patient is ready to begin return to running program
 Walking counts! 3500-4000 loading cycles per session *prior to* beginning program

Return to running What should I do if:

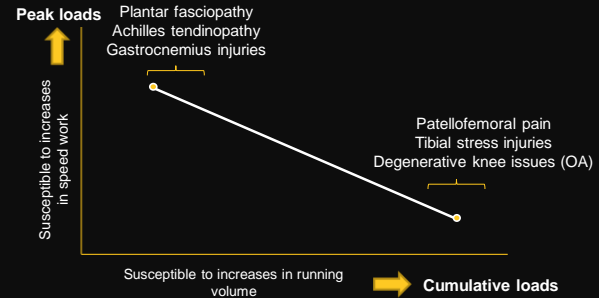


"Pain" ≥3/10 on visual analog scale*
 *depends on diagnosis

Soreness Rules, Adapted from Snyder-Mackler 1996

Will the real load parameter step forward?

Nielsen et al., 2013, Edwards 2010, Miller 2014



Return to running: Achilles tendinopathy



- Treadmill training Willy 2016
- Hills DeVita 2008, Swanson & Caldwell 2000
- Speedwork sessions Schache 2011, Dorn 2012
- Soft surfaces, e.g., trail Knobloch 2008

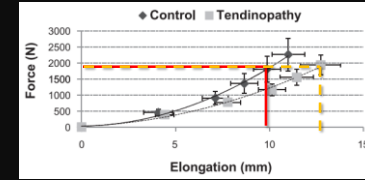
Do in isolation first,
then slowly combine

Caution: Can be injury mechanism if capacity exceeded!!

Avoid soft surfaces intially. Why?



Runner with
tendinopathy



Running on (Knobloch 2008):

- Soft surfaces: 10-fold greater risk in tendinopathy
- Leg & Achilles stiffness needs overwhelm capacity
- Hard surfaces: 53% lower risk of tendinopathy

RECOMMENDATION: add in flat trails and hills on pavement *separately*, eventually combine

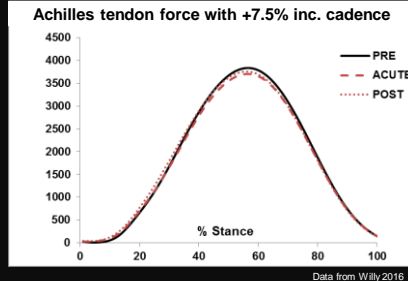
What about increasing cadence for Achilles tendinopathy?

7.5-10% increase in run cadence



0-3.6% Lower Achilles tendon forces *per step*

Net: no difference and perhaps even an increase in cumulative Achilles tendon forces!



Key info to take back to the clinic

- Consider multi-faceted loads of the runner
- Patient-specific: always work toward their goals
- Patient education is critical
- Reduce load during running, increase tissue tolerance
- Go slower than you think!



LaTrobe LASEM

Acknowledgements

Co-presenters

Collaborators: John Willson, PT, PhD; Stacey Meardon, PT, PhD; Paul DeVita, PhD,
Ryan Mizner, PT, PhD, Christian Barton, PT, PhD

Rich.willy@umontana.edu



@rwilly2003

