

Restoring load capacity in the injured runner
 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

- Epidemiology of running-related injury
- Why do runners think they get injured?
- Framework for evaluating and treating the injured runner
- Three Main Take Home Points

The new running boom

Only 62% of Americans meet CDC guidelines www.CDC.gov

Of these, 22% use running to meet levels www.CDC.gov

Upwards of 16 million Americans run at least 3x/week National Sporting Goods Association, 2009

Nearly a 300% increase since 1990 runningusa.org

1990: Female runners 25%

↓

2013: Female runners 57%

Why run?

Delays Alzheimer and Parkinson's disease
 Lessens risk and severity of strokes
 Improves mood and cognition
 Improves sleep
 Decreases stress
 Improves muscle strength
 Protects against atherosclerosis
 Improves function in heart failure
 Increases energy levels and endurance
 Improves digestion
 Limits obesity
 Lowers incidence breast and colon cancer
 Counters diabetes
 Improves Fertility
 Prevents hypertension
 Improves lipid profiles
 Slows muscle atrophy and prevents sarcopenia
 Strengthens immune system
 Maintains bone density and decreases osteoporosis risk
 Best current therapy for Peripheral Artery Disease
 Maintains joint mobility
 Prevents falls in elderly
 Delays aging
 Improves circulation
 Improves the health of off-spring
 Improves self-esteem

Rowe, Circulation, 2014

Epidemiology of running injuries

19.4%-79.3% incidence of running injuries van Gent 2007

Novice runners: inc. >30BMI Nielsen 2014

If obese and novice, highest risk if initiate running with > 3km in the 1st week! Nielsen 2014

Shutterstock.com

Where do runners get injured?

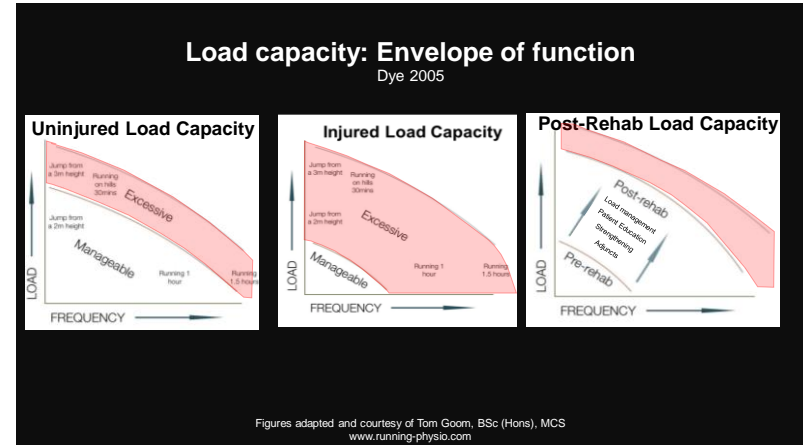
Steinacker, 2001 Taunton 2003

Thigh 3.4%	Hip/pelvis 9.7%
Ankle 11.1%	Knee 50%
Foot 14%	Lower leg 26.7%

Where do runners get injured?

Taunton 2002, Callahan 2000, Matheson 1987, Cameron 2013, Lopes 2012

Patellofemoral pain 48.8% of knee injuries Female: 62% Male: 38%	Iliotibial band syndrome 1.9-12% Female: 62% Male: 38%
Tibial stress fractures (Tibial stress syndrome) 2.2-7.8% Female: 73.6% Male: 26.4%	Achilles tendinopathy 9.1-10.9% Female: 42% Male: 58%



Quadriceps atrophy
Giles 2013, Lankhorst 2013

Aerobic fitness
Neely 1998

Limited training volume
Rauh 2014

Psychosocial
Domenech 2014, Piva 2009

Previous history
Rauh 2005, Lankhorst 2015

Training load
Nielsen 2012, Hall 2015, Rathleff 2016

Running hard, hills
Rauh 2014

Proximal mechanism
Noehren 2013, Neal 2016

Distal mechanism
Nielsen 2012

Tissue tolerance, Ability to adapt

Biomechanical loading

Is psychological stress related to running-related injury?

Greater perceived stress → higher likelihood of unplanned training volume or intensity

Individuals more worried about overall health → higher risk of running related injury

Perfectionism → increased risk of injury in junior athletes & medial tibial stress syndrome in runners

Greater perceived stress → Greater incidence of stress fracture in military

Perceived pressure from others → more likely to train impulsively

Lower perceived mental wellbeing is predictor of running-related injury

Madigan 2018, Luedke 2018, Fields 2010, Moran 2013, Messier 2018, Guskiewicz 2008



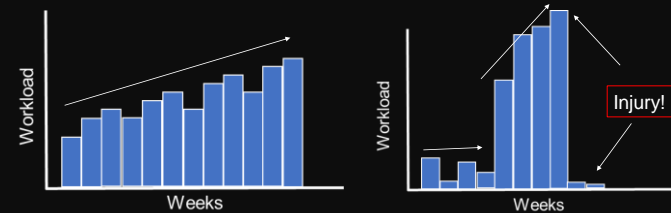
What do runners perceive as causes of running injuries?

Saragiotto 2015



Take Home Point 1:
Consider psychosocial factors in your treatment plan. Patient education is a must!

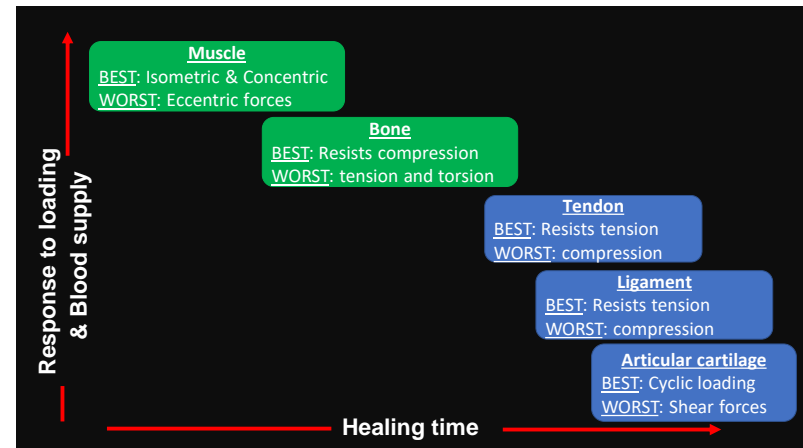
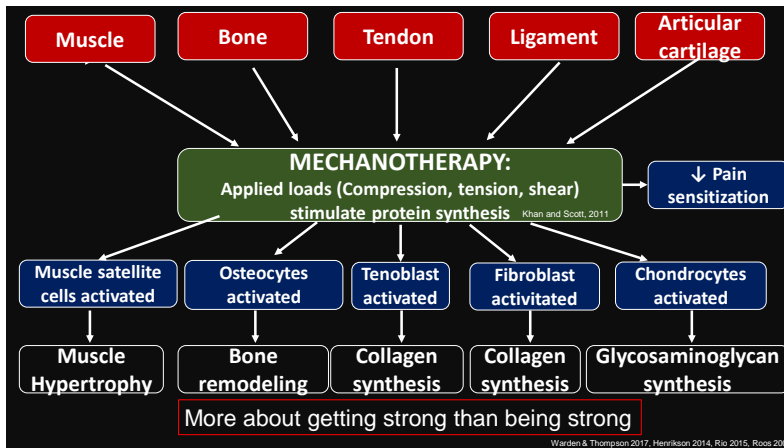
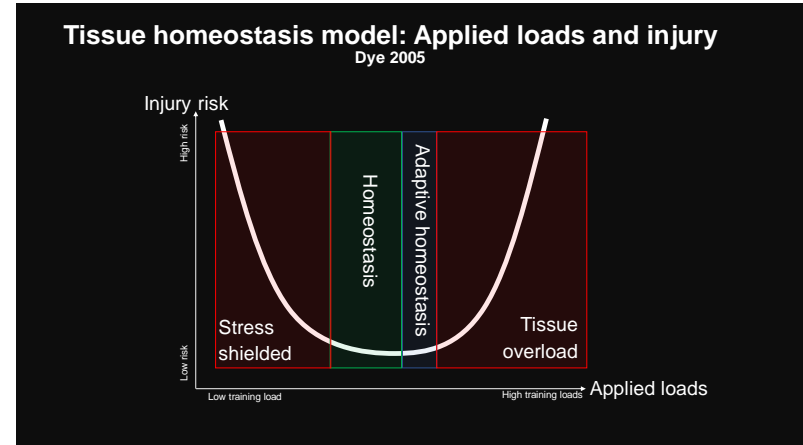
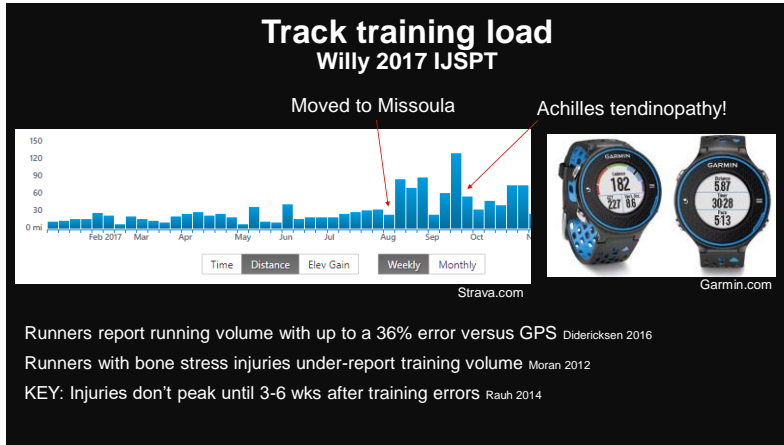
The role of recent loading history in risk of injury

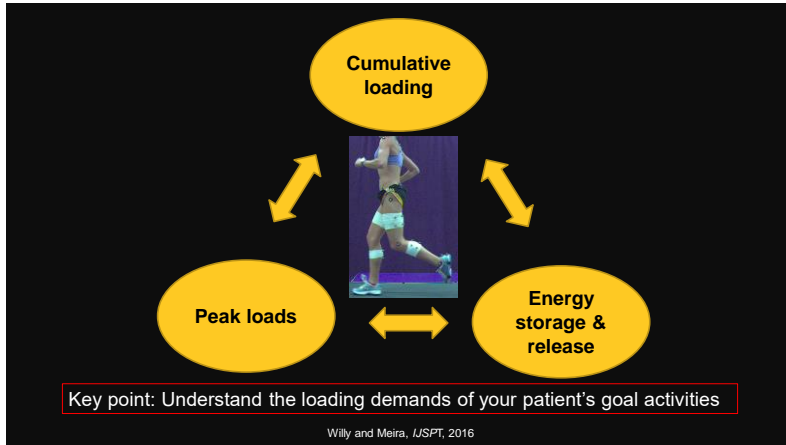


Domains of training load:

- How much?
- How intense?
- How frequently?

} "10% rule" does not capture this





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

Patient education (Icon: head with question mark)

Tolerance to high tissue loads

Heavy resistance training (Image: person lifting weights)

Energy storage/release (Image: person running)

Cumulative loads (Image: bar chart showing increasing workload over weeks)

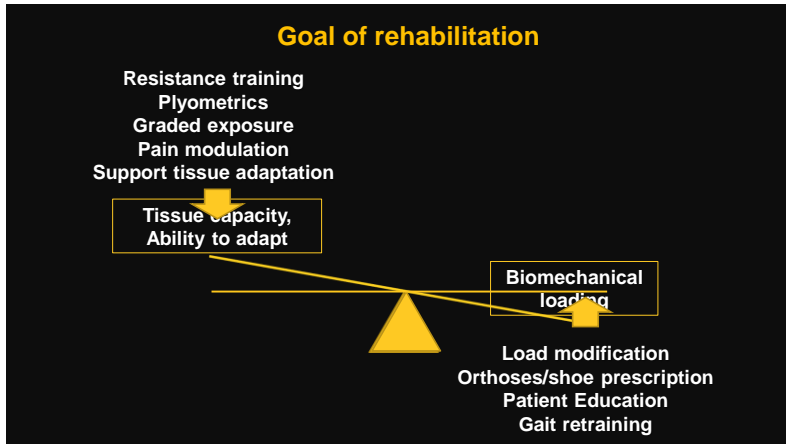
Return to running

- Graded return (Image: bar chart showing workload over weeks)
- Gait retraining, if needed (Image: person running on a treadmill)

Plyometrics (Image: person performing plyometric exercises)

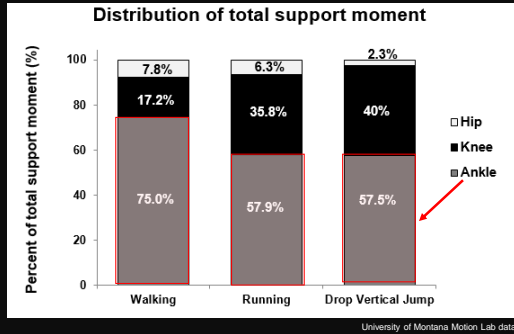
Adjuncts (Image: shoe insert and knee brace)

Lack PTIS 2018, Willy and Meira IJSPT 2016, Barton PTIS 2018



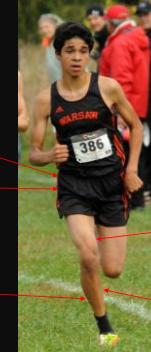
Take Home Point 2:
Be deliberate in the structure of your treatment plans

Is it really all about the glutes?



Muscle forces during running

Dorn 2014



Gluteus maximus
1.5-2.8 BW force

Gluteus medius
2.6- 3.5 BW force

Soleus
6.5-8.0 BW force

Quadriceps
4-6 BW force

Gastrocnemius
2.5-3.0 BW force

Body weight exercises just don't get it done

Peak Achilles tendon force: Running (6:10-4:37/km):

4.5-8.0 Body weights Achilles tendon force

Sinclair 2015, Willy 2016, Komi 1990, Farris 2012, Miller 2009, Almonroeder 2008

Unweighted Single leg heel raise:

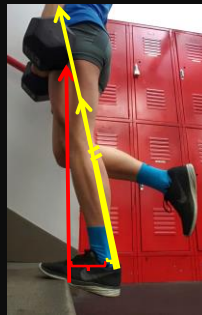
3.5-3.9 Body weights Achilles tendon force

Gheidi PTIS 2018

Walking (1.3 m/sec):

3.5-3.7 Body weights Achilles tendon force

Gheidi PTIS 2018, Willy AJSM 2017

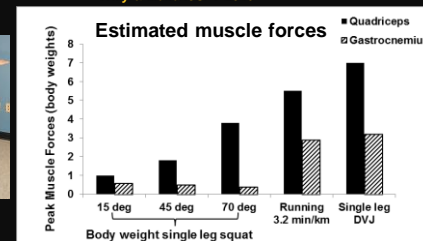


Is a single leg squat really "functional"?

Willy & Meira IJSTP 2016



Willy & Davis 2011



Single leg squat data from Kulas et al., Clin Biomech 2012

Running data from Dorn et al., JEB 2012

Single leg DVJ data unpublished data from our lab

At 70° knee flexion, a single leg squat requires:

31-46% less peak quad force

~85% less peak gastrocnemius force

} Compared with running or single leg DVJ

Take Home Point 3:
**We probably underload our runners in
 rehabilitation**

Critical to success in treating the runner

Multi-faceted loading is a foundation of running
 Stress shielding, i.e., offloading, really has no place
 in rehab: Keep moving!
 Consider psychosocial influences
 We are probably under-rehab'ing runners
 Progression of loading should be deliberate,
 probably far more incremental



Acknowledgements

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Rich.willy@umontana.edu

 @rwilly2003



PT and runners: the credibility gap

Really get to know running
 Understand typical training volume
 Be able to spot training errors
 Knowledgeable of shoes
 "Maybe running isn't for you"
 GOAL: Get runners to make peace
 with their past runner.



Gogriz.com



Do non-running factors matter?



Gettyimages.com

Sleep

- Decrease in stress fractures via enforced sleep (≥ 6 hrs) & reducing cumulative marching Finestone and Milgrom 2008
- Adolescent athletes: sleep < 8 hours were 1.7x (95% CI: 1.0-3.0) more likely to sustain injury Milewski 2014