

## The Master runner: Maintaining durability

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The presenter has no financial relationships or product endorsements to disclose



Nike.com



BAA.org

## Disclosures

I have no product endorsements or other financial relationships to disclose

## Outline

Why continue to run as we get older?  
Change in running mechanics with age  
Change in tissue mechanics with age  
Injury risk with age  
Strategies to combat age-related changes:

## The changing demographics of the runner

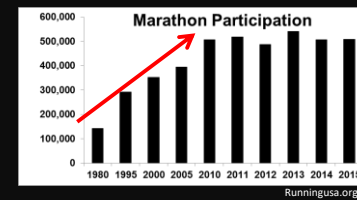
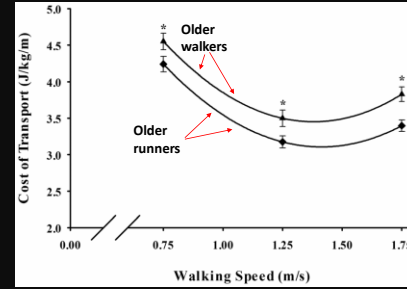




Photo credit: Stan Grossfield, Boston Globe



Ortega PLOSOne 2014

Older runners

Older walkers

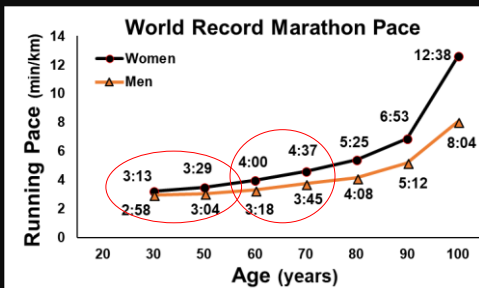
Age: 68.9 ±4.7

Age: 68.9 ±3.0

Lean mass: 48.6 kg ±9.2

Lean mass: 39.2 kg ±7.1

### Marathon world records across lifespan



Adapted from Trappe 2007



Canada Running Series

### Why do we slow down with age?



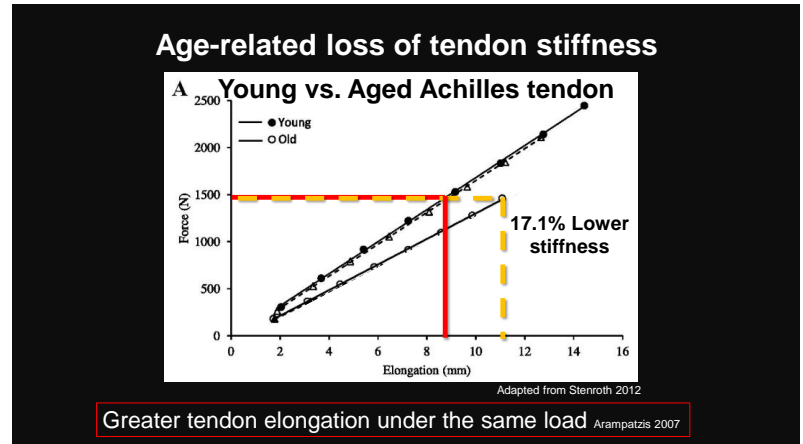
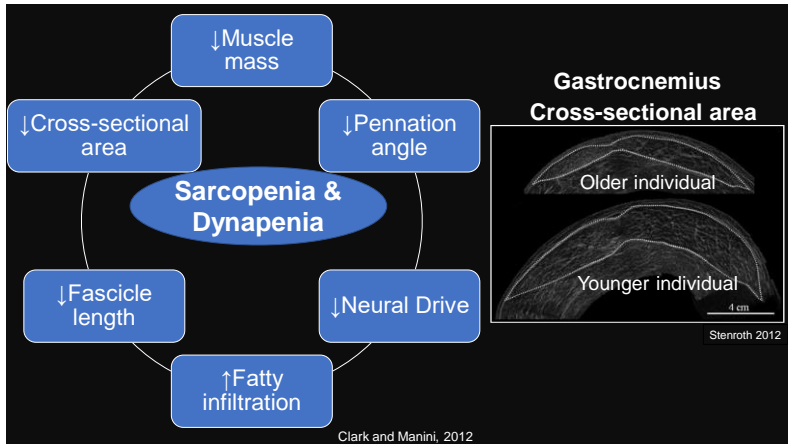
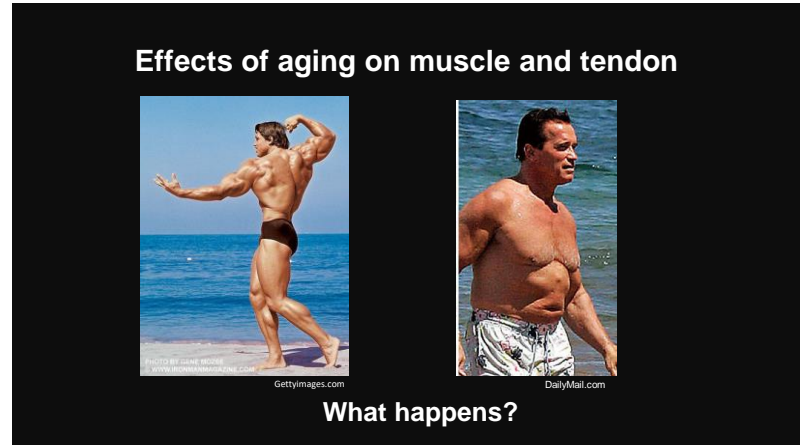
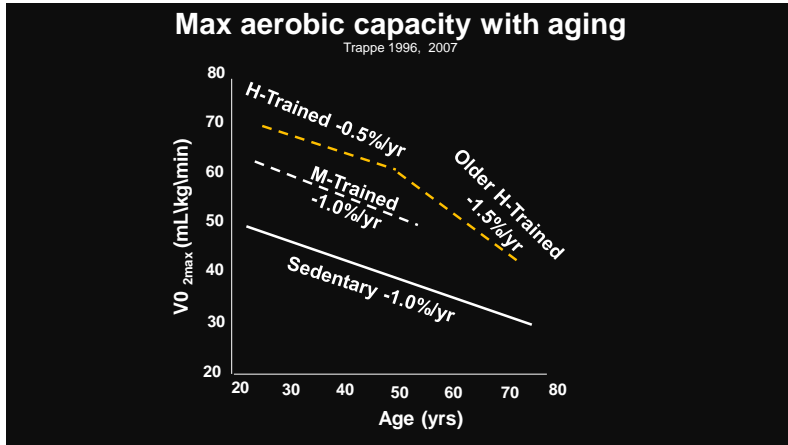
Gettymages.com

Age 27: 2:24:52



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Age 52: 2:51:29



### Age-related loss of leg stiffness

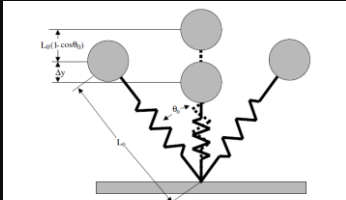
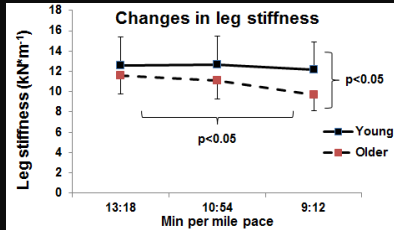


Fig. 2. Leg stiffness model used for calculating leg stiffness when the leg makes contact with the surface in a non-vertical position. Butler 2003

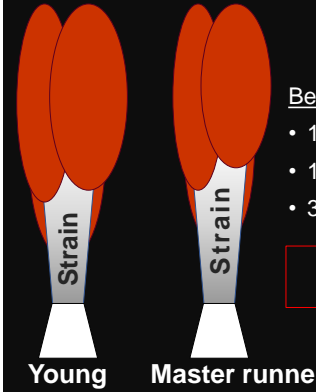


Adapted from Beck et al., 2016

Master runners exhibit lower leg stiffness Beck 2016

Differences become larger as speed increases Beck 2016

### Plantarflexors take the biggest hit



Between ages 20-60:

- 15% Reduction in physiological CSA
- 17.1% Reduced Achilles tendon stiffness
- 31% Less plantarflexor power during running

Loss of propulsive forces:  
-13% step length by age 60

Arampatzis 2007, Stenroth 2012, DeVita 2015, Beck 2016

### Injury distribution in the masters runner

Lopes 2012, McKean 2007, Taunton 2002, Kelly 2006

45% injury rate  
24% mult. injuries



**Knee**  
24.8-48%

**MTSS/TSI**  
13.6-20%



49% injury rate  
30% mult. injuries

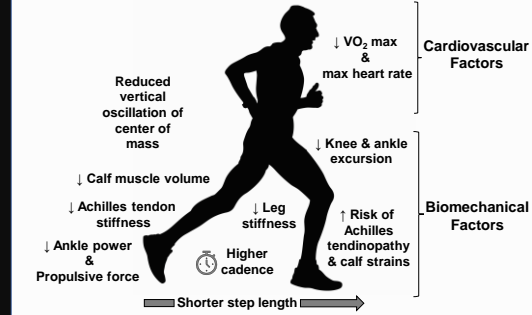
**Calf**  
9.4%

**Achilles**  
8.6-18.5%

**Plantar Fasciopathy**  
9.8%

Running is not associated with initiation of OA Miller 2017

### Age-related Changes in the Master Runner

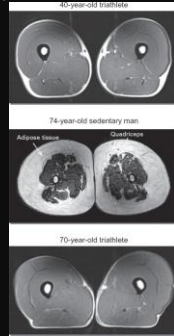


Willy and Paquette, in press, Sp. Med. Arthrosc. Review

## “Exercise and the Master Athlete—A Model of Successful Aging?” Hawkins et al 2003

Highly trained Master athletes (mostly) preserve critical muscle qualities Wroblewski 2011, Hawkins 2003

Chronic endurance training alone insufficient to maintain muscle mass and function Hawkins 2003, Tarpinning 2004



Wroblewski 2012

## Intense training sessions (perhaps) protective

Cont'd bouts of intense running slows decline:

- VO<sub>2</sub> max Trappe 2006
- Leg stiffness Pantoja 2016
- Propulsion forces and ankle power\* Paquette 2017

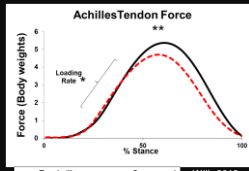
\*Maintaining higher running volume does too, but to lesser extent

What we don't know:  
Does adding intense sessions reverse losses?



Nike.com

## Ways to add intensity to run training: Targeting plantarflexors



Willy 2016



Corbin.com



RichardMurray.com

- Regular treadmill training Willy 2016
- Hill repeats DeVita 2008, Swanson & Caldwell 2000
- Speedwork sessions Schache 2011, Dorn 2012

These need to be done regularly.

**Caution: Can be injury mechanism if capacity exceeded!!**

## Capacity training: Target plantarflexors



Recommendations Rønnestad and Mujika, 2014:

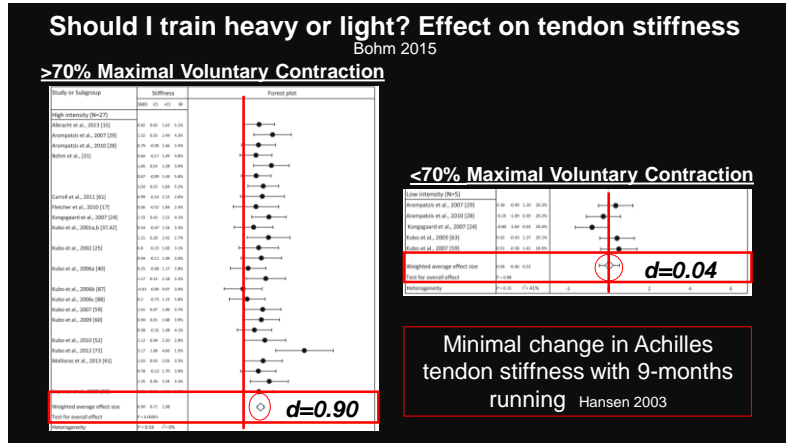
Preparatory: 2 Sessions per week, 2-3 weeks

2-4 sets, high vol. (15 reps)  
2-3 min rest

Off-season, pre-season: 2 Sessions per week

2-3 sets, 4-10 RM  
2-3 min rest

In-season: 1-2 Session per week




### Plan for reduced rate of adaptability

Older Achilles tendons take 24-36 hrs to regain stiffness Akermans 2016

Adolescent tendons *more* adaptable, Older not as quick Svensson 2016


- Very slow collagen turnover
- Slower adaptive increase in cross-sectional area

Fluorquinolone and Statin use: Reduced rate of collagen synthesis 6-9 months Kirchgessner 2014, Lang 2017



### Take home points:

- Running has a lifetime of health benefits
- Decline VO<sub>2</sub> max: key driver in reduced running velocity
- Plantarflexors should be a focus in Master runners
- Regular, heavy strength training
- Maintain regular bouts of intense training



Missoulian.com


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Co-presenters

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