Strength Training & Fascia Student Manual

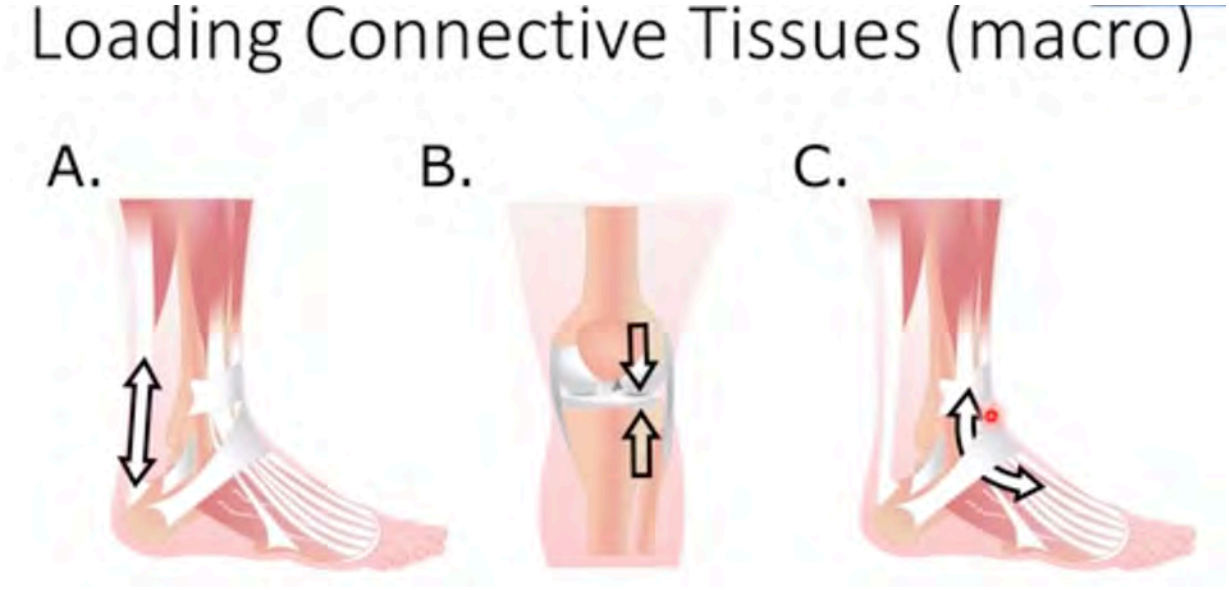
FASCIA
TRAINING ACADEMY

DELOS
INSTITUTE

Presented by
Eric Owens
Dr. Keith Baar
Michol Dalcourt &
Bill Parisi

Load Adaptation

Genetically speaking, all the connective tissue cells within a tendon, cartilage and retinaculum, start out as the same cell type, but it's the mechanical load placed upon them that triggers their differentiation into different cell types, shapes and functionality.

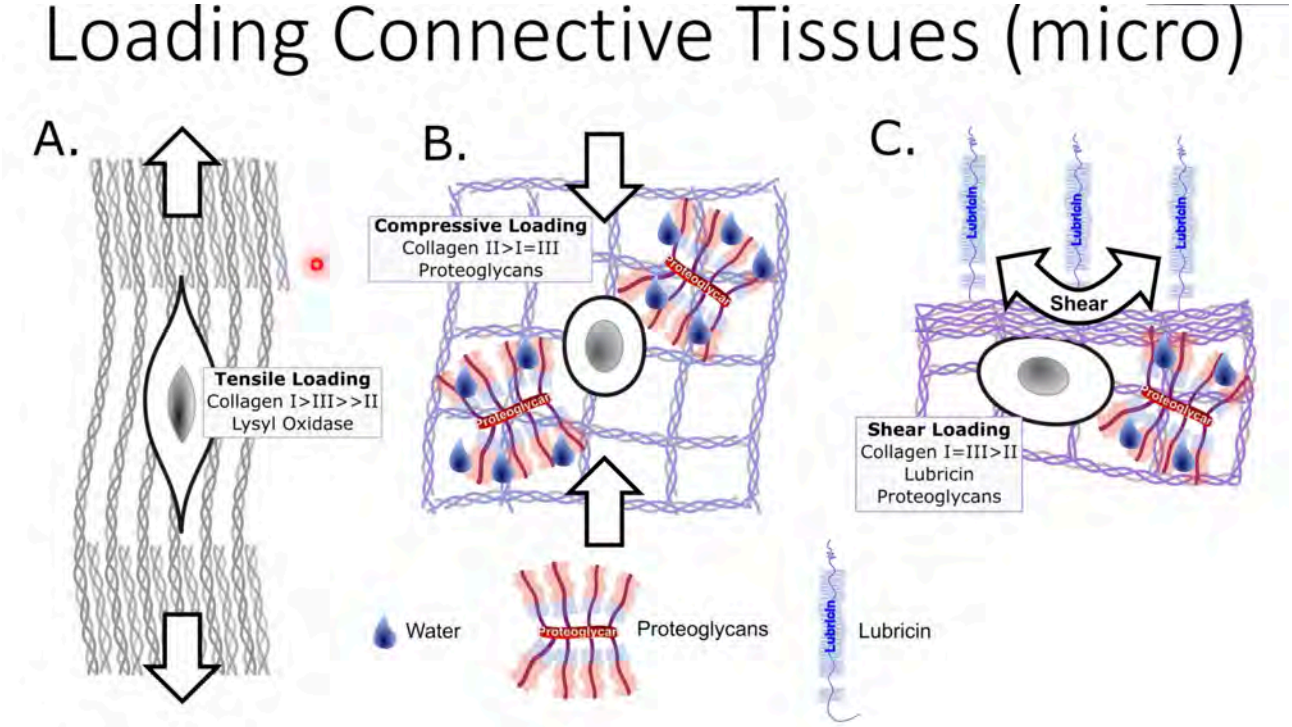


[Image from Fascia Research Society: Loading Connective Tissue, 7:44]

When we take a closer look at each of these structures, we can see the three loading forces cause cellular changes in the fascia. What are these three loading forces?

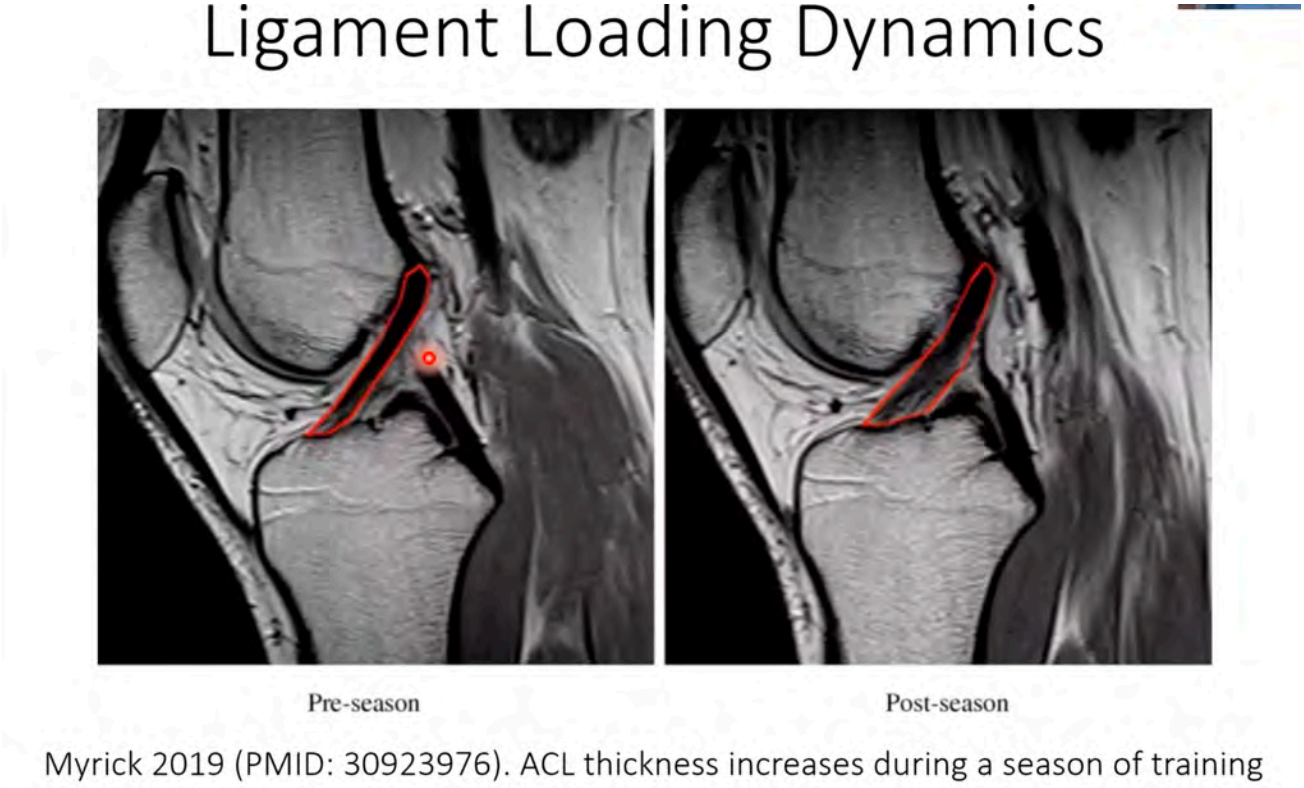
1. _____
2. _____
3. _____

What are the differences between collagen types 1, 2, and 3?



[Image from Fascia Research Society: Loading Connective Tissue, 11:30]

NOTES:



[Image from Fascia Research Society: Loading Connective Tissue, 13:20]

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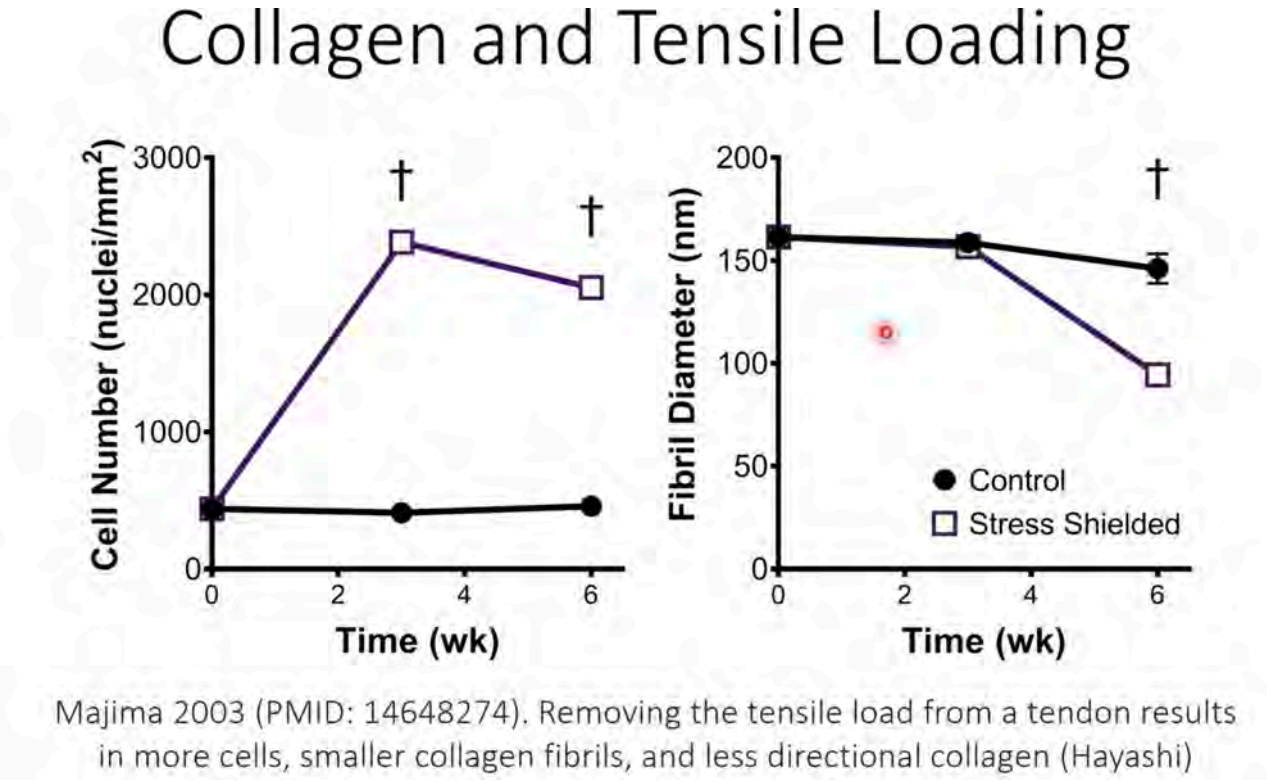
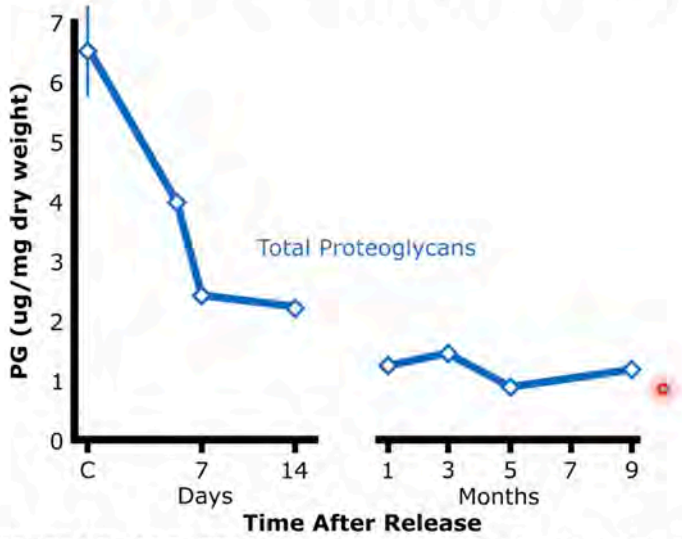


[Image from Fascia Research Society: Loading Connective Tissue, 16:31]

NOTES:

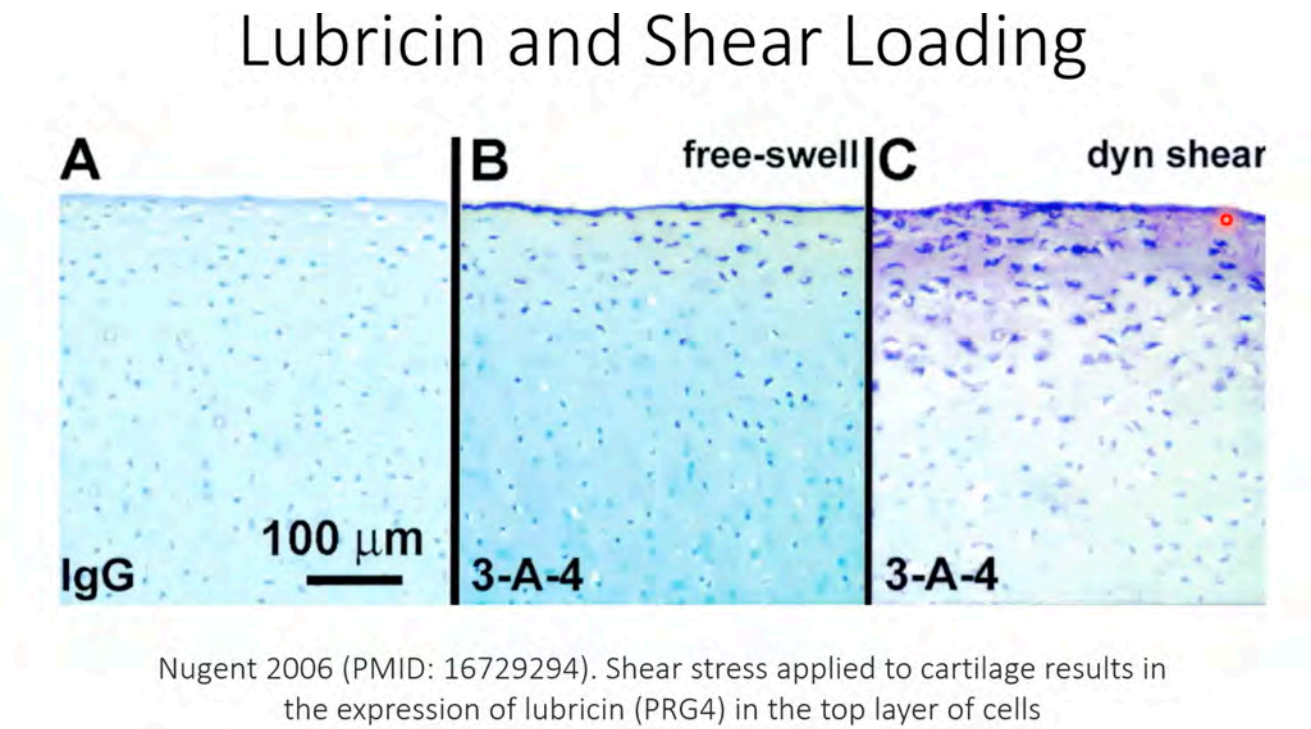
Proteoglycans and Compressive Loading



Gillard 1979 (PMID: 158485). Releasing a tendon from under the talus quickly decreases proteoglycans in the formerly compressed region

[Image from Fascia Research Society: Loading and Nutrition, 17:51]

NOTES:



Nugent 2006 (PMID: 16729294). Shear stress applied to cartilage results in the expression of lubricin (PRG4) in the top layer of cells

[Image from Fascia Research Society: Loading and Nutrition, 20:30]

In a study focusing on lubricin, researchers took cartilage out and exposed it to repetitive shearing forces and examined the tissue architecture. What they found was a morphological change in the top layer of fascia and the expression of more lubricin protein while the bottom layers of the fascia remained unchanged.

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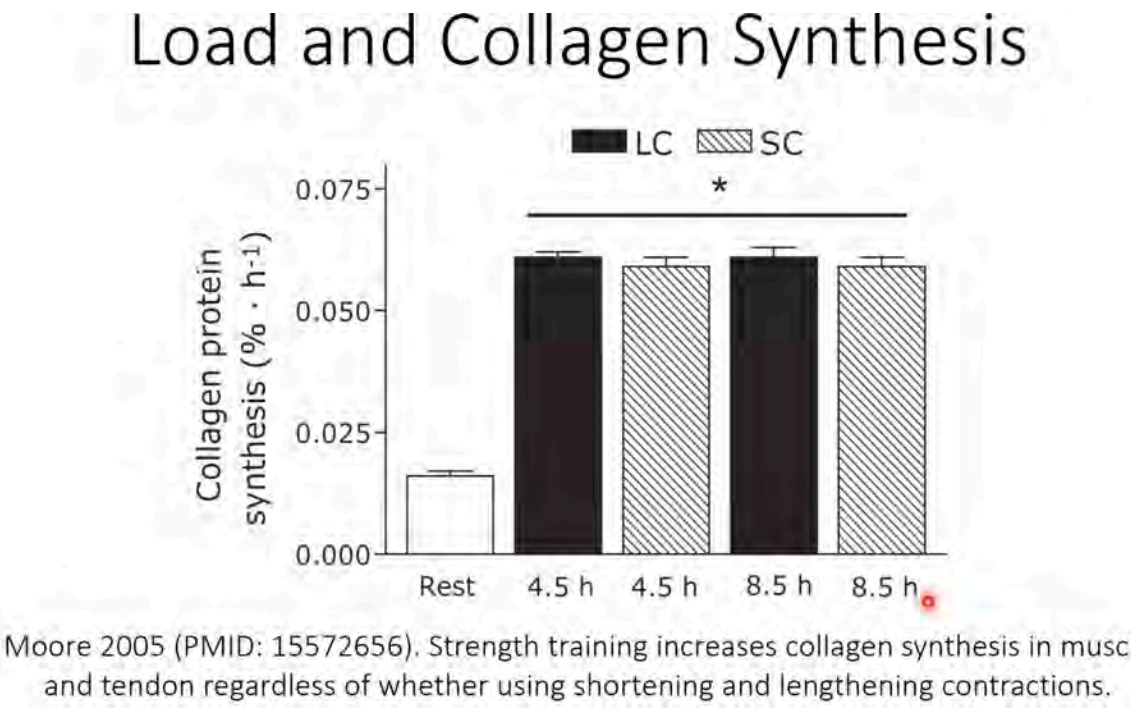


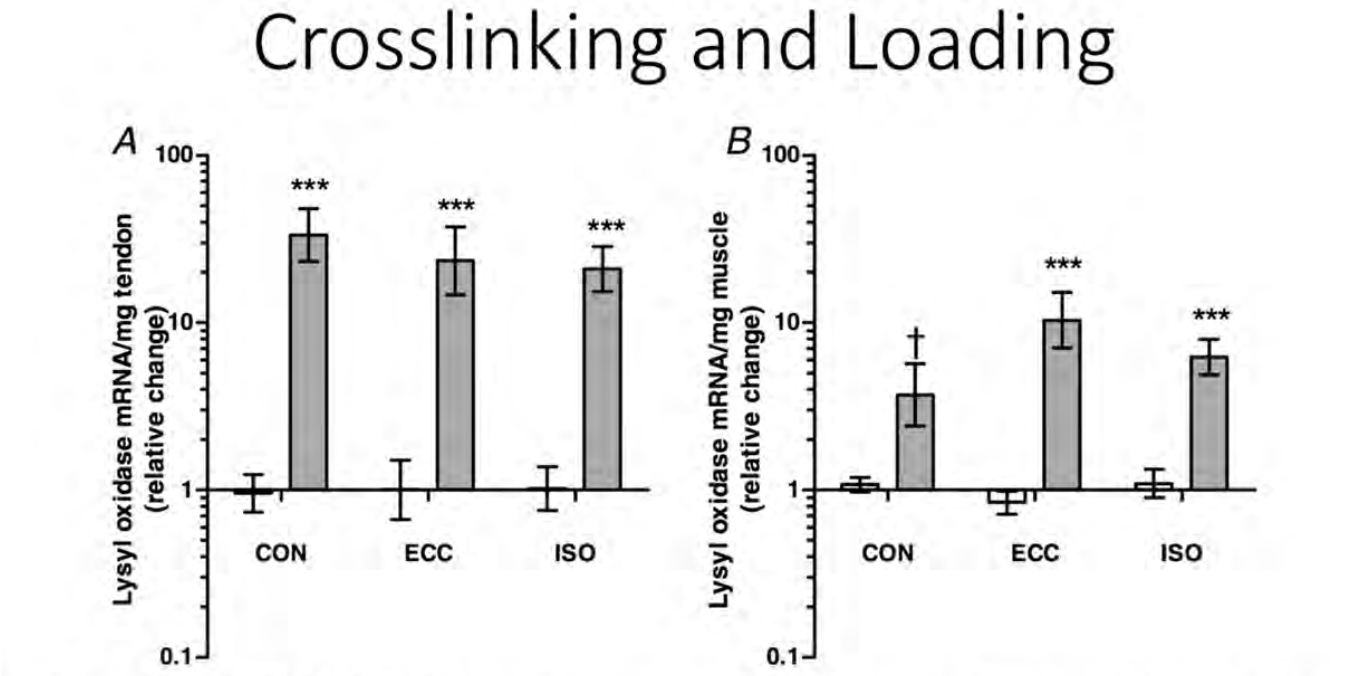
Moore 2005 (PMID: 15572656). Strength training increases collagen synthesis in muscle and tendon regardless of whether using shortening and lengthening contractions.

[Image from Fascia Research Society: Loading and Nutrition, 26:49]

There are two main components to what determines strength from a fascial perspective.

1. _____
2. _____

Strength training has consistently shown that _____ and _____ are related whether using _____ or _____ contractions and typically show a 3-fold increase.



Heinemeier (PMID: 17540706). Exercise increases the expression of lysyl oxidase, the enzyme that crosslinks collagen. Bigger increase in muscle with lengthening contractions in muscle

[Image from Fascia Research Society: Loading and Nutrition, 28:02]

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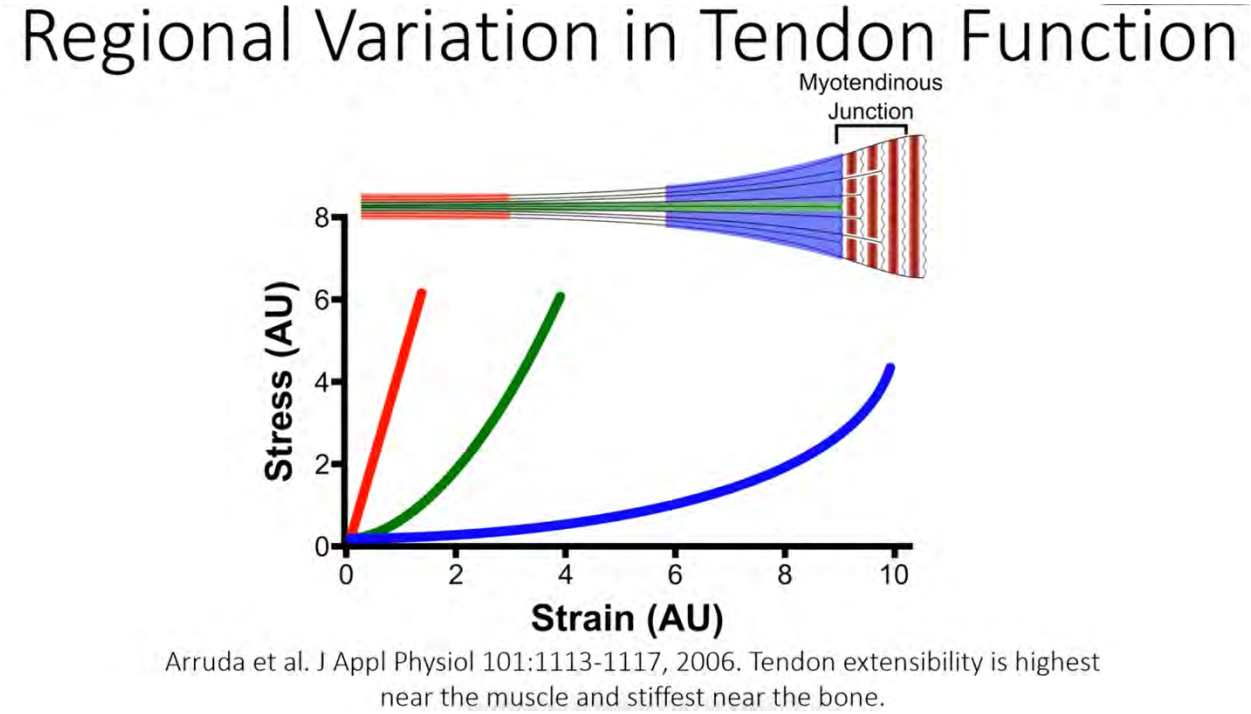
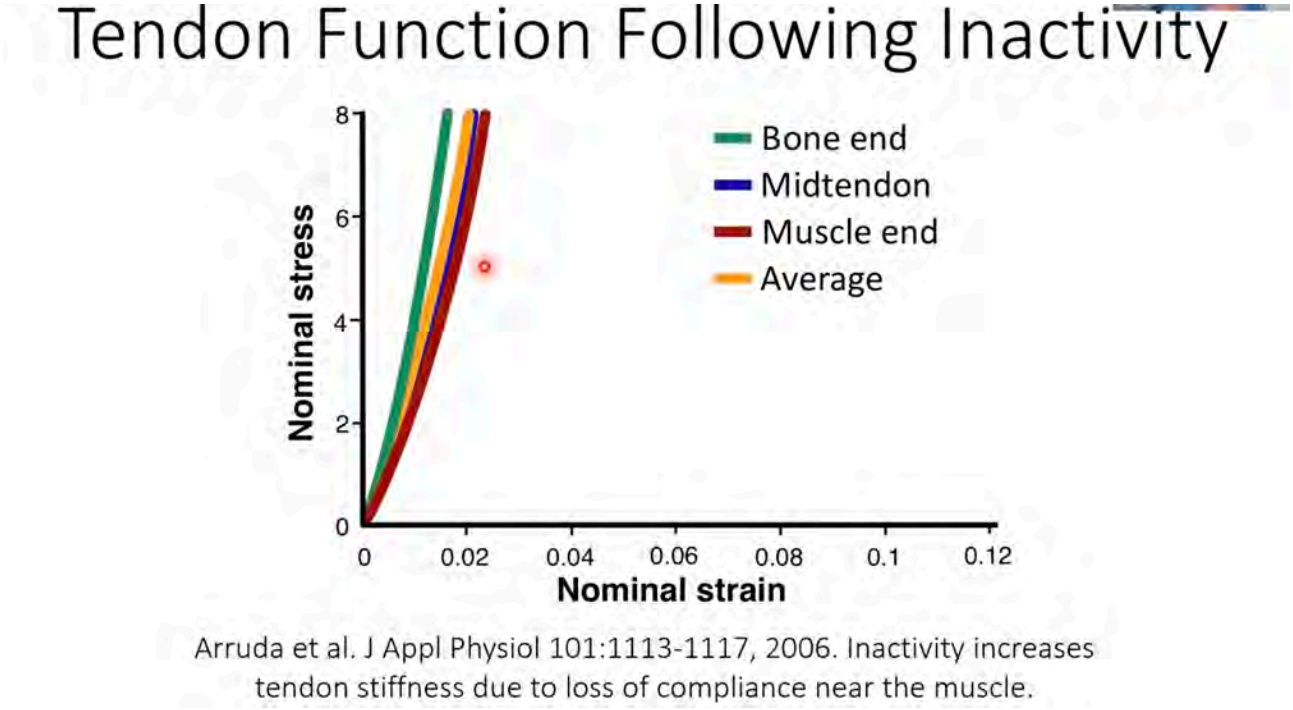


Arruda et al. J Appl Physiol 101:1113-1117, 2006. Tendon extensibility is highest near the muscle and stiffest near the bone.

[Image from Fascia Research Society: Loading and Nutrition, 31:11]

All of this shows us that strength training _____ collagen proliferation and _____ expression in various connective tissues.

This is important because:



[Image from Fascia Research Society: Loading and Nutrition, 37:56]

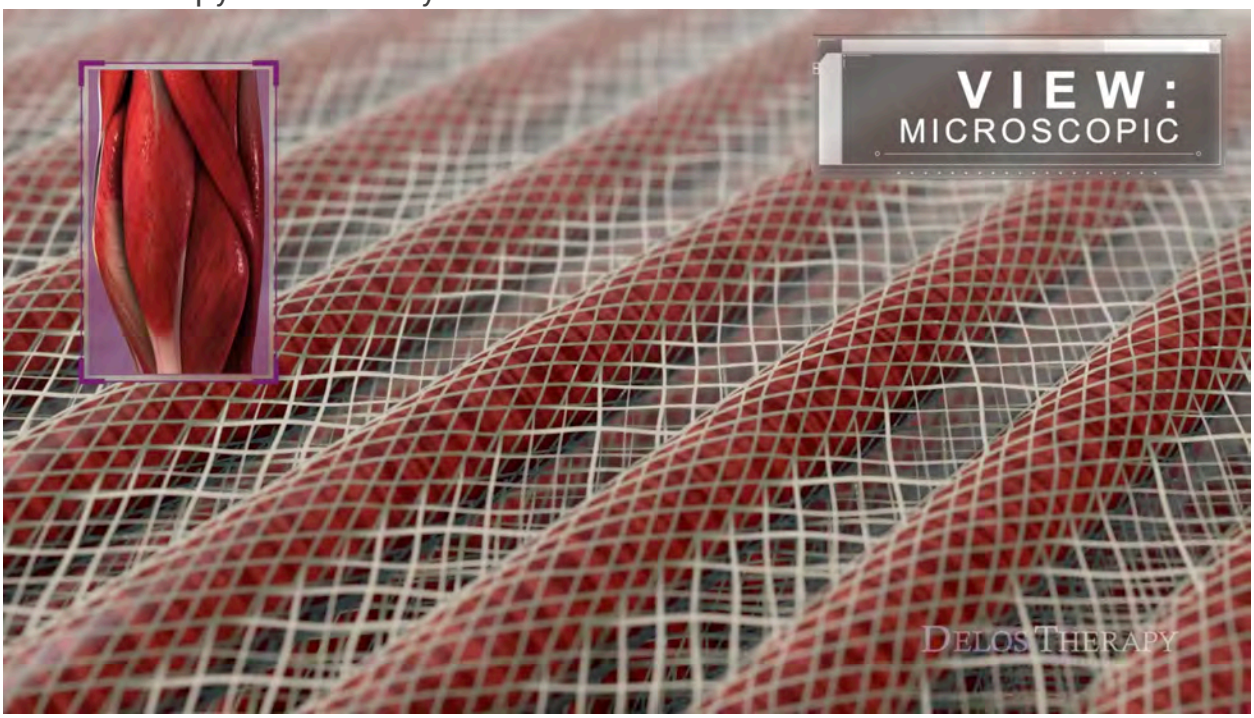
However, a problem arises when tendons are stiff but muscles are weak. This can occur with _____, or _____ activity without muscles that are used to bearing _____.

During inactivity:

During strength training:

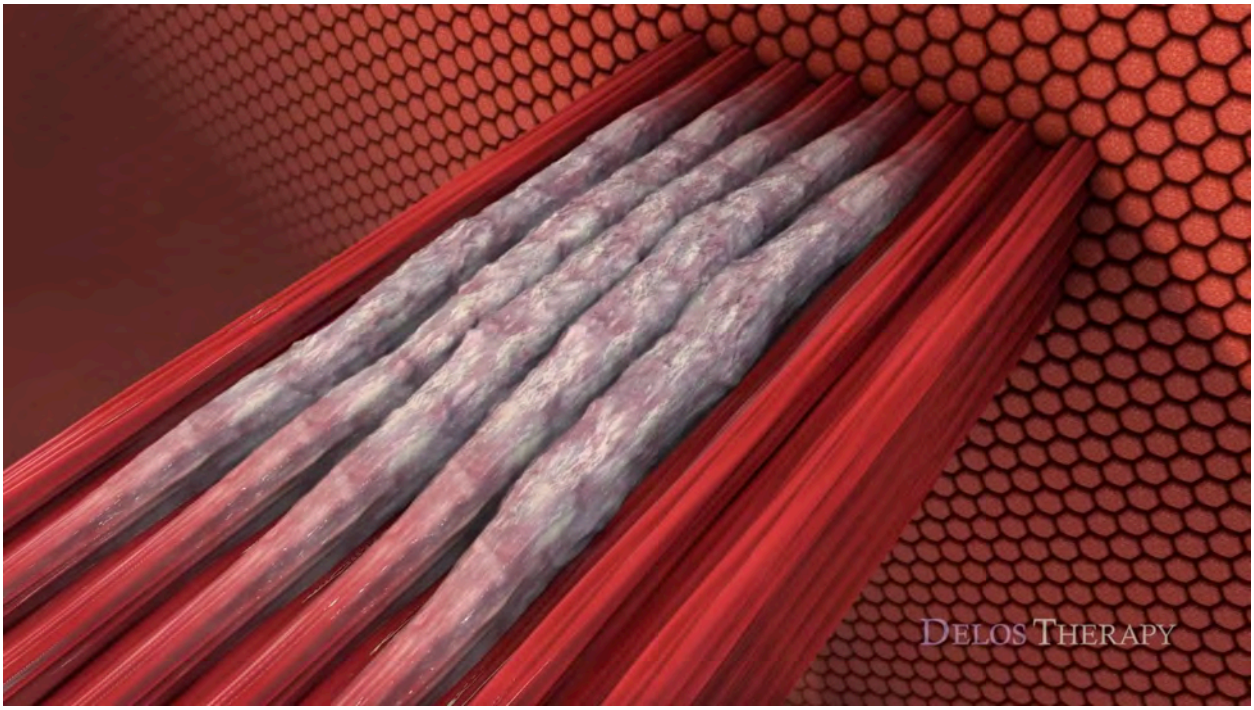
VIDEO

Delos Therapy Muscular Dysfunction & Fascial Fibrosis



[Video from Delos Therapy, Technique Medical Animation, 0:36]

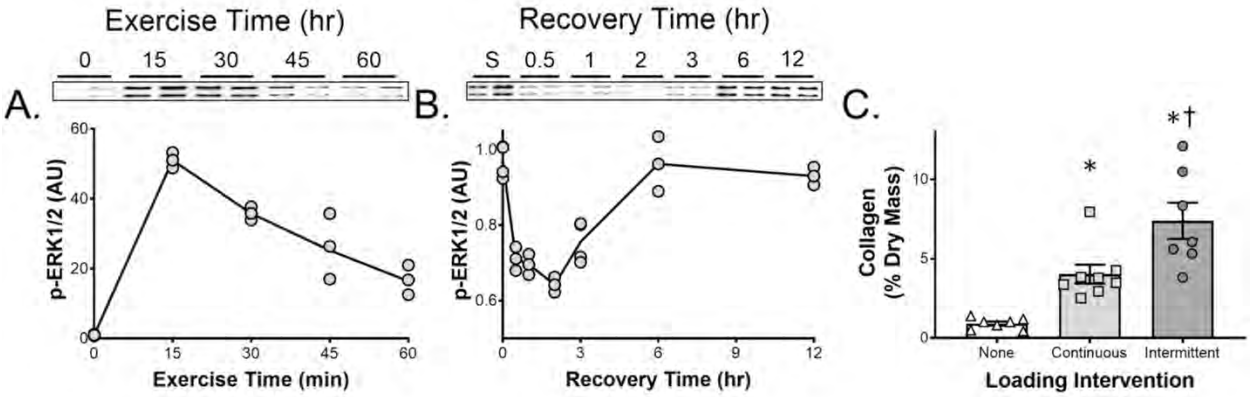
[Video from Delos Therapy, Technique Medical Animation, 0:36]



[Video from Delos Therapy, Technique Medical Animation, 0:36]

NOTES:

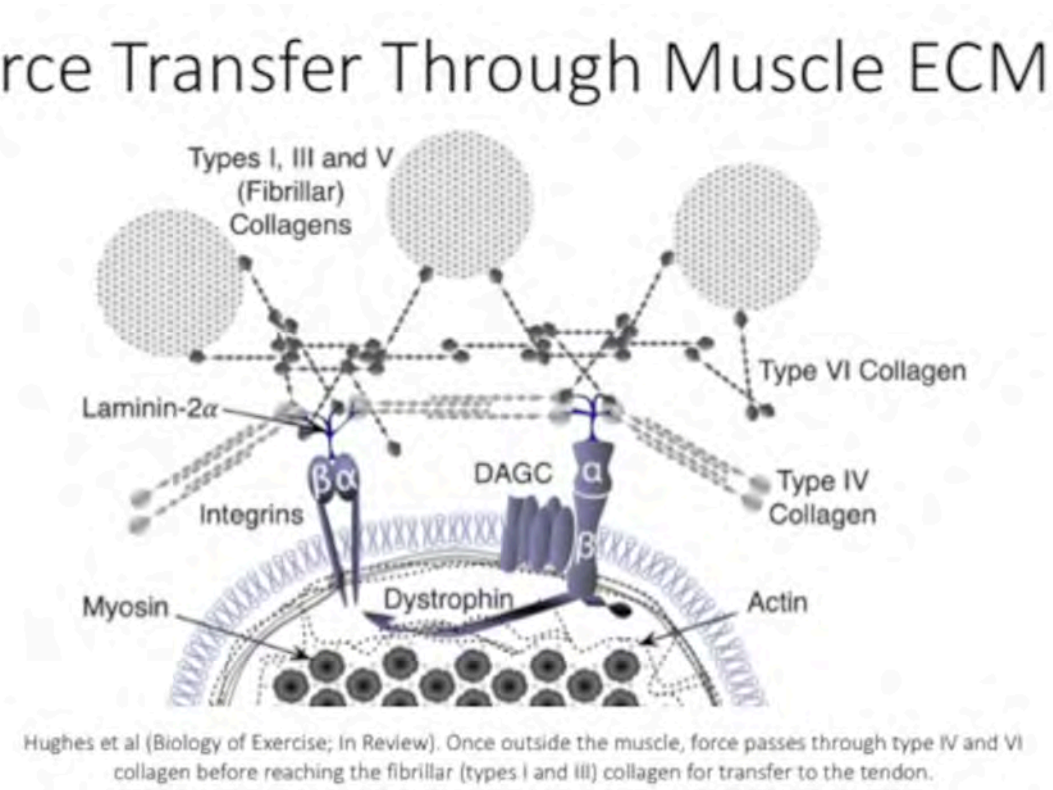
Optimal Loading of Connective Tissues



Paxton (PMID: 21902469) Maximal training effect in tendon/ligament cells occurs after 10 minutes. It takes ~6 hours to return exercise sensitivity and intermittent training increases collagen synthesis more

[Image from Fascia Research Society: Loading and Nutrition, 42:40]

What's the optimal effective dose to get the best connective tissue response?



[Image from Fascia Research Society: Regulation of Connective Tissue Function, 9:45]

When looking at intramuscular force transmission, _____ protein transmits the force out laterally from the muscle through the _____ and into a transitional collagen (collagen type _____ nto the more fibrillar collagens (collagen type 1 and 3) to effectively transmit force from the muscle through the _____ and _____

So, what happens during muscle hypertrophy versus strength?

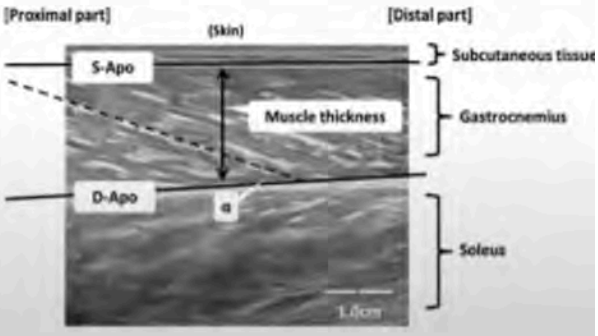
Recovery: Foam rolling, Cryotherapy and Stretching

Foam Rolling

Yoshimura et al. 2019
J Strength Cond Res
online ahead of print, doi: 10.1519/JSC.0000000000003196

Crossover study, involving 22 male students compared the FR intervention targeting the gastrocnemius muscle with a control trial.

- Foam Rolling induced ROM improvement in ankle dorsiflexion and plantarflexion
- But no significant differences were found in fascile length and aponeurosis displacement
- **Concluded that FR induced no change in morphology of muscle.**



[Image from Connect2021, Schleip, 11:21]

NOTES:

VIDEO

[Video from Delos Therapy, Technique Medical Animation, 1:43]

[Video from Delos Therapy, Technique Medical Animation, 1:52]

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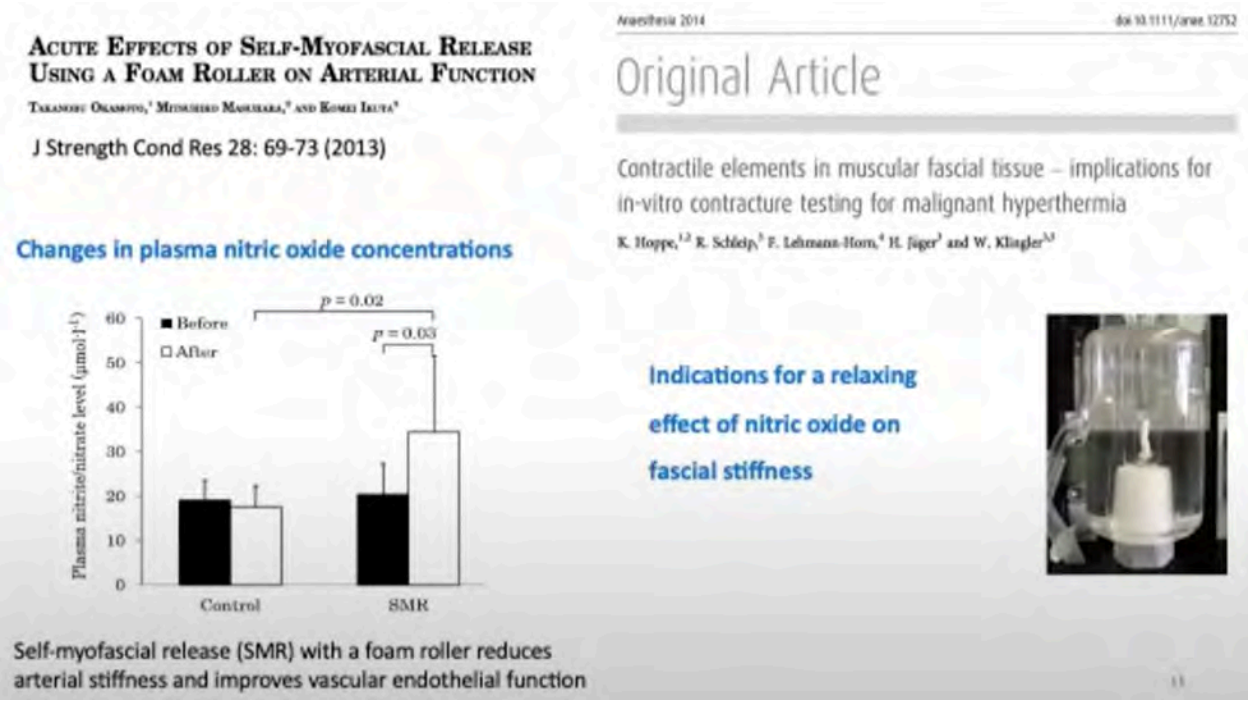
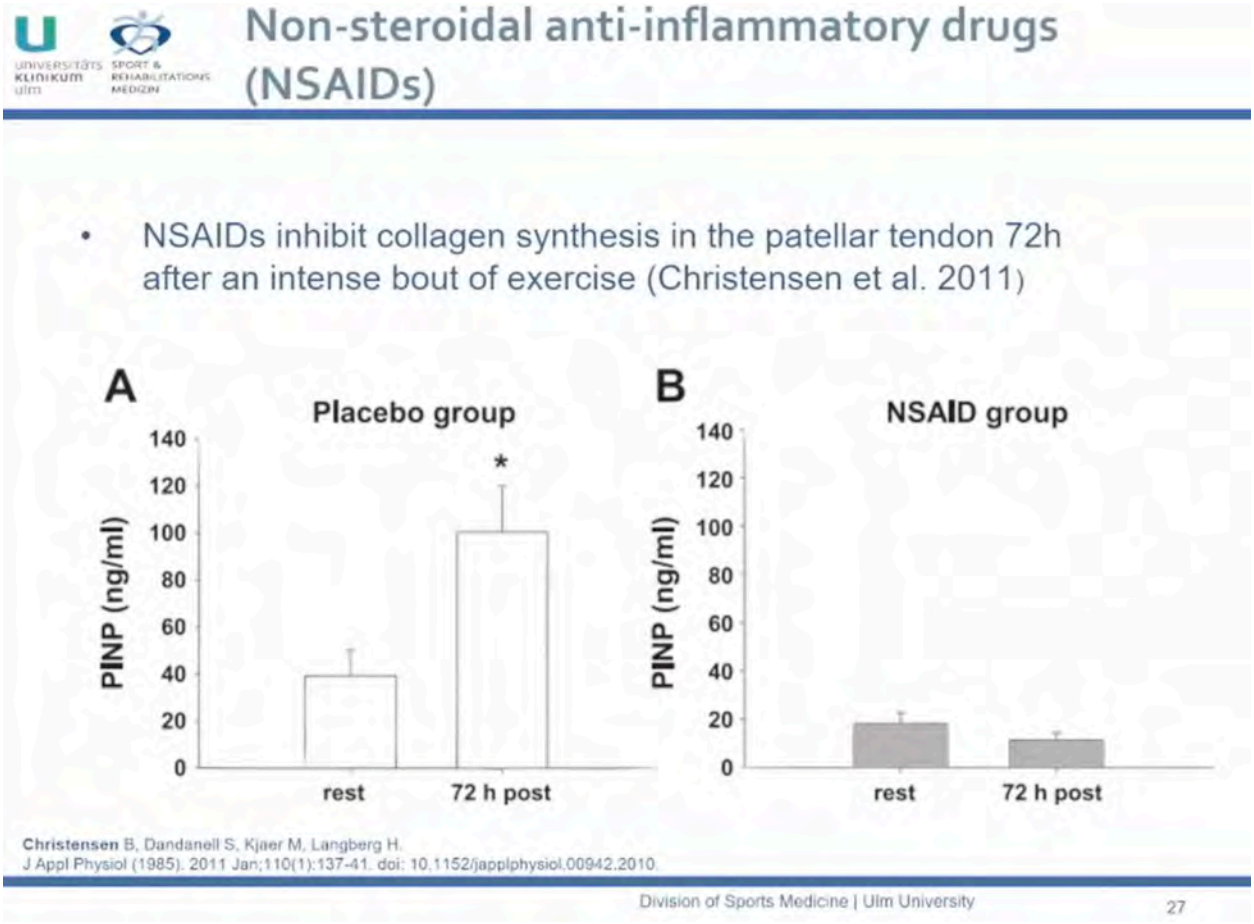


[Image from Connect2021, Schleip, 20:30]

NOTES:

Inflammation and Cryotherapy



[Image from Connect2021, Steinacker, 1:40:28]

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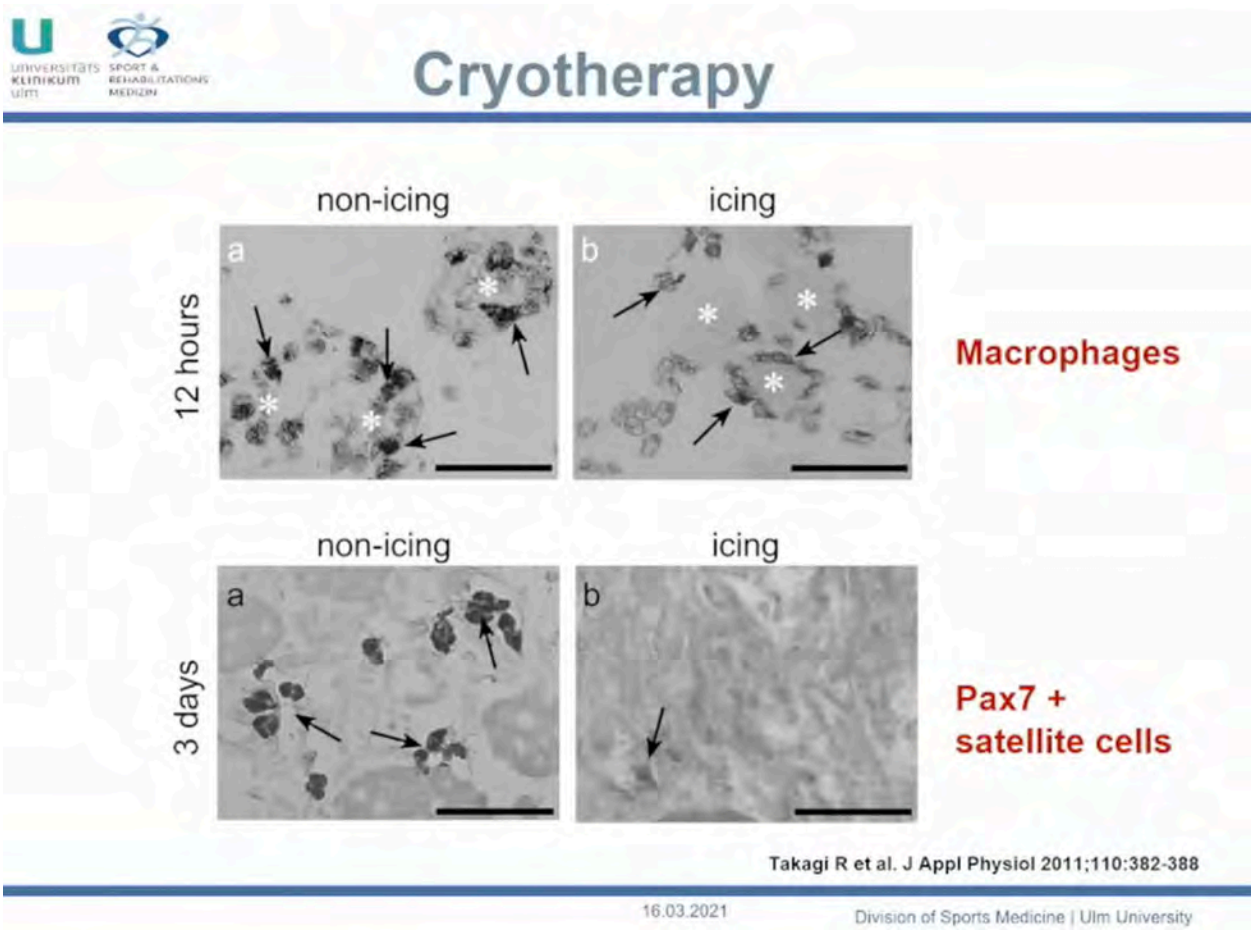
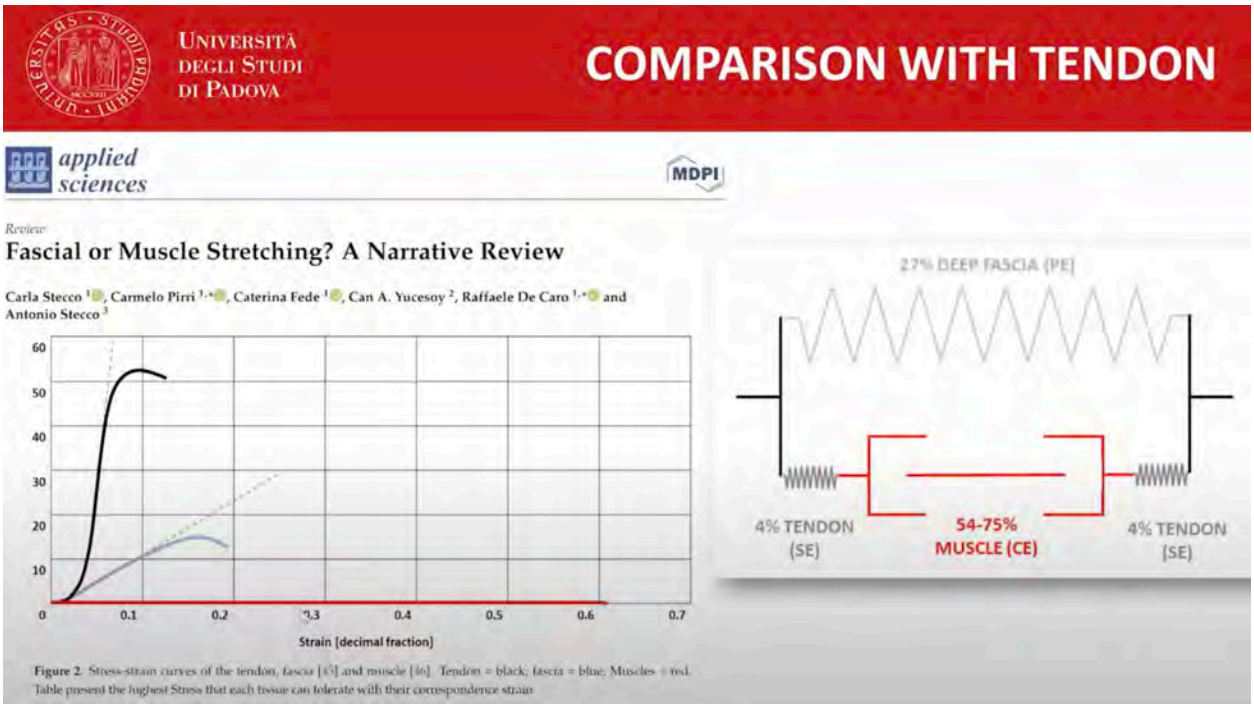


[Image from Connect2021, Steinacker, 1:42:05]

NOTES:

Stretching



[Image from Connect2021, Stecco, 5:15:25]

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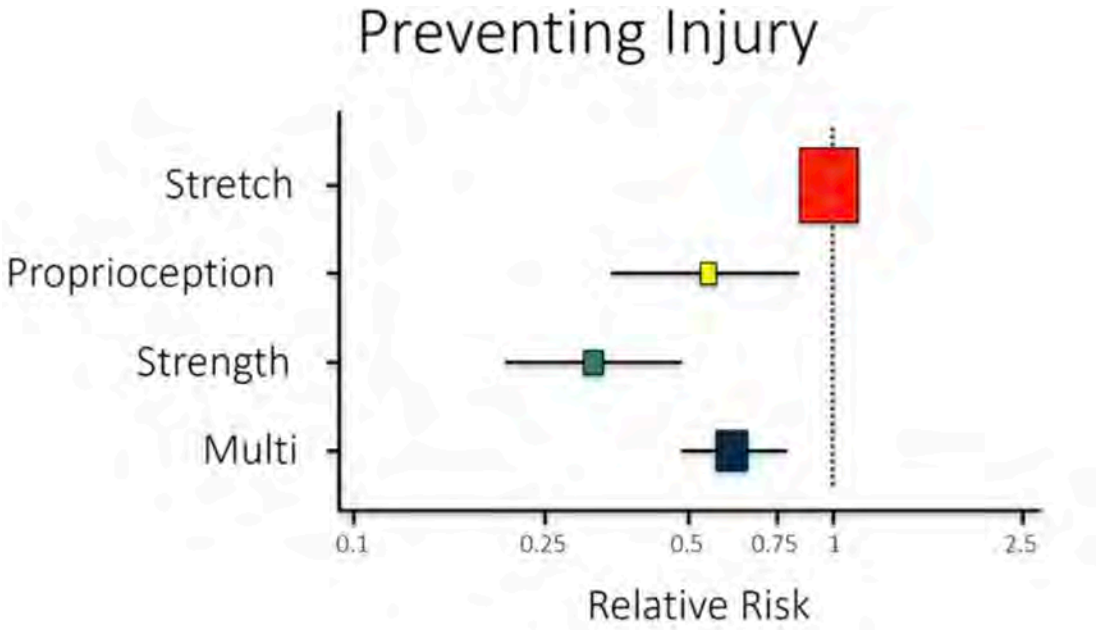


Lauersen JB, et al. 2014 (Br J Sports Med;48:871). Strength training decreases the risk of injury by ~2/3rds. By contrast, stretching has no effect on the rate of injury.

[Image from Fascia Research Society, Connective Tissue in Sports Medicine, Baar]

NOTES:

Stretching versus Strength Training

Manual Therapy 15 (2010) 26–31

Contents lists available at ScienceDirect

Manual Therapy

journal homepage: www.elsevier.com/math

Original Article

Stretching versus strength training in lengthened position in subjects with tight hamstring muscles: A randomized controlled trial

Cecília F. Aquino [a,*], Sérgio T. Fonseca [b], Gabriela G.P. Gonçalves [c], Paula L.P. Silva [d], Juliana M. Ocarino [e], Marisa C. Mancini [b]

[a] Fundação Educacional de Divinópolis, FUNEDI, Av. Sete de Setembro, 949, Centro, Divinópolis, Minas Gerais 35500-011, Brazil

45 subjects with tight hamstrings were assigned into 3 groups:
control, stretching and strength training in lengthened position;
performed 3x/wk for 8 wks.

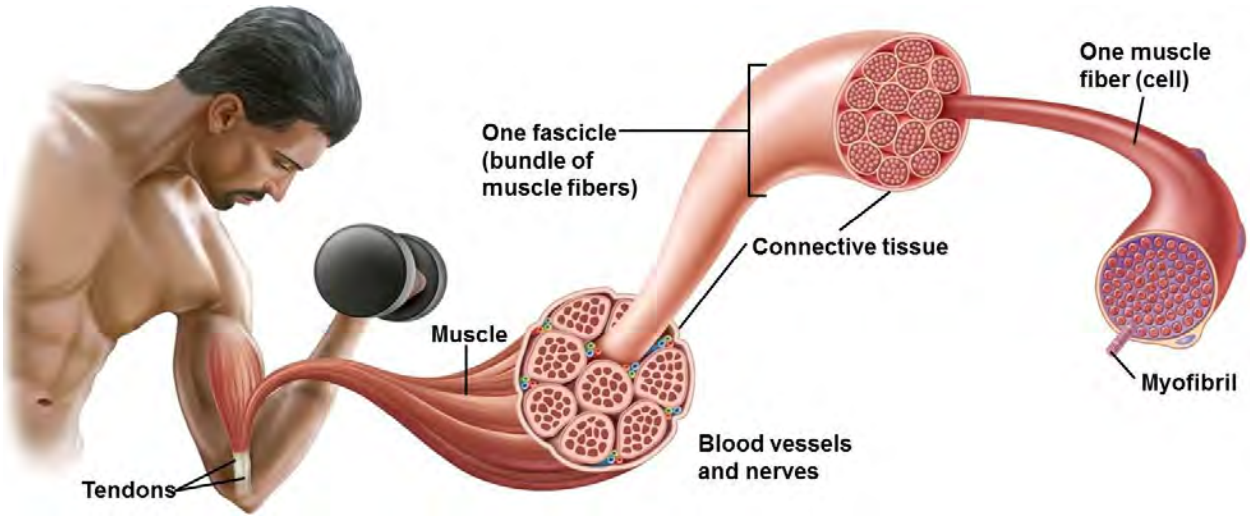
- Stretching as well as Strengthening increased stretch tolerance.
- **Only strengthening produced modification of flexibility.**

[Image from Fascia Research Society, Connective Tissue in Sports Medicine, Baar, 24:00]

Is stretching vs strength training better for hip flexibility and hamstring length?

NOTES:

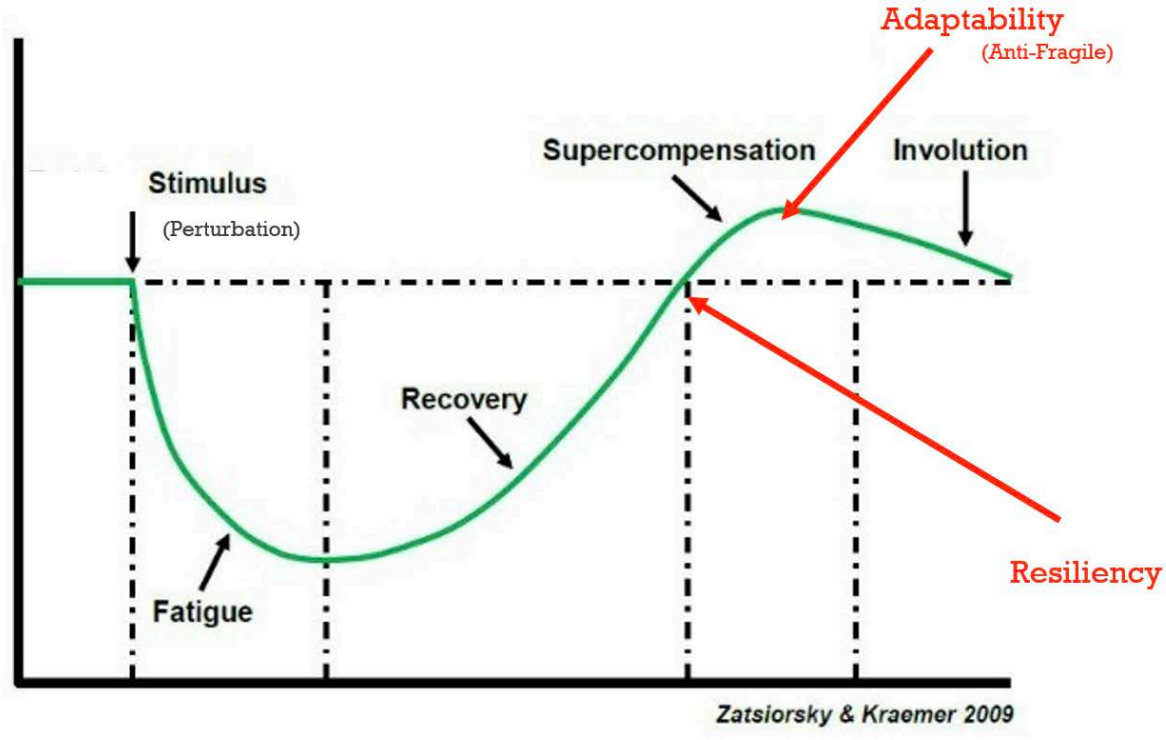
Conclusion and Key Takeaways



[Image from Unicus Fitness, blog Resistance Training, September 23, 2016]

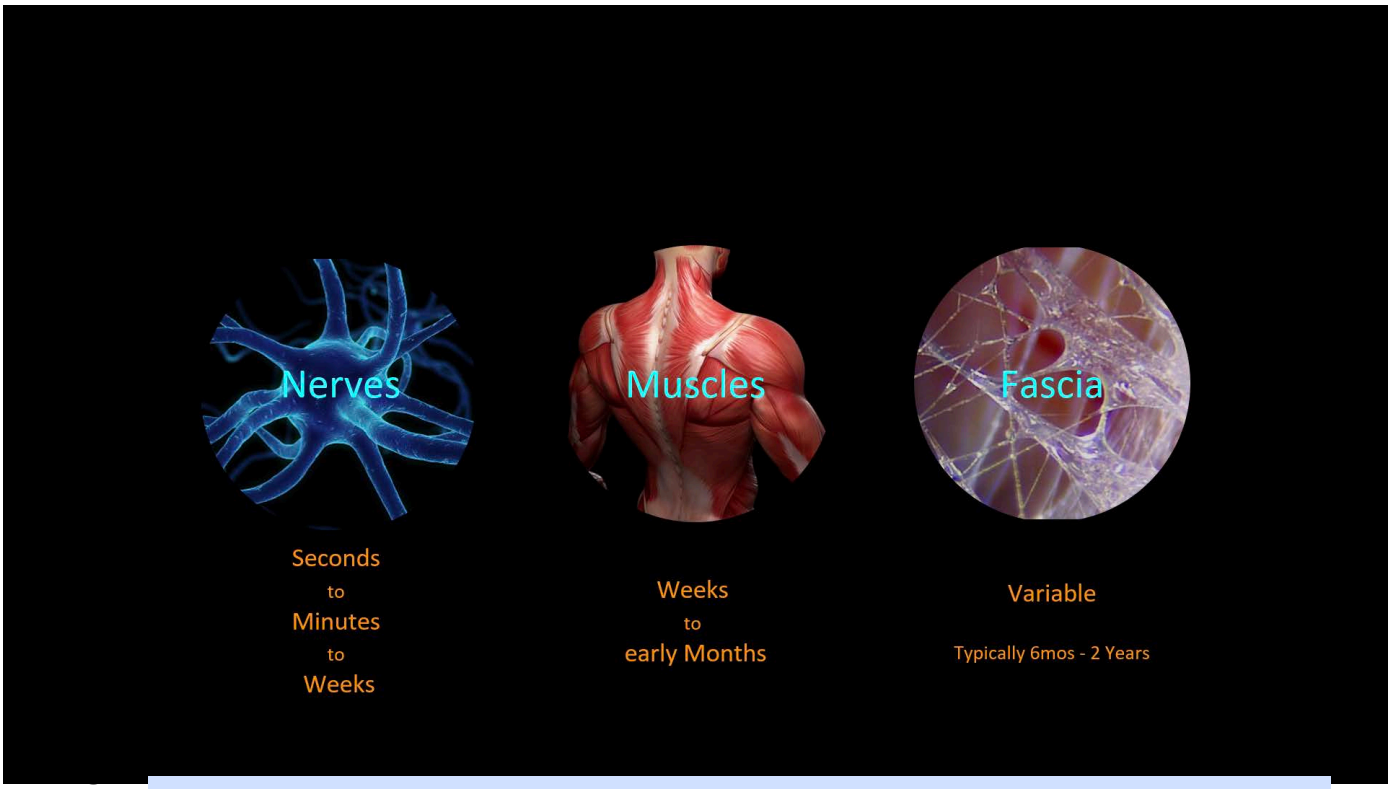
- The 4 main properties of fascia are viscosity, elasticity, plasticity, remodeling.
- There are multiple layers of fascia all connected to each other from superficial to deep and various body-wide meridians laid out in the anatomy trains.
- Golgi tendon organs and muscle spindles are two important mechanoreceptors measuring tension and stretch, respectively.
- Tension, compression and shear are three types of load that causes differentiation of connective tissue
- Removing tensile load leads to scar formation in connective tissue
- Strength training increases collagen proliferation in connective tissue along with an increase in lysyl oxidase crosslinking enhancing strength and force transmission
- Inhibition of collage proliferation doesn't affect hypertrophy but attenuates strength by 50%

Anatomical Adaptation: Resiliency vs. Adaptability



NOTES:

Training Adaptation Timelines



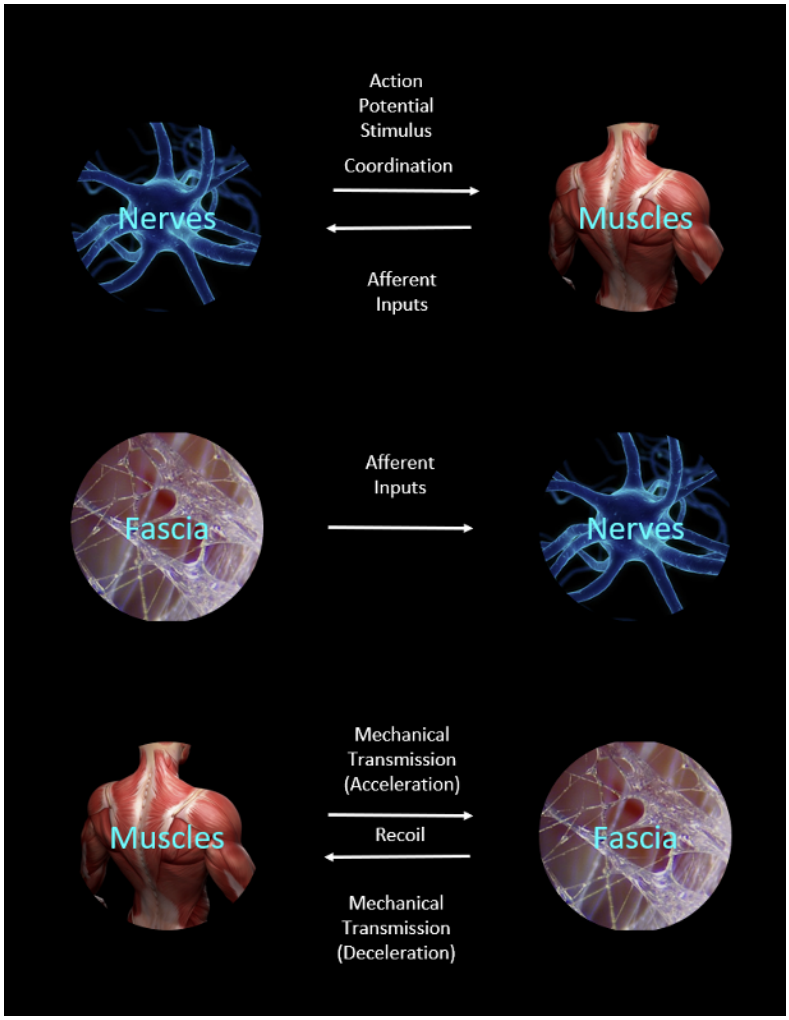
Nerves: _____

Muscles: _____

Fascia: _____

NOTES:

System Integrations

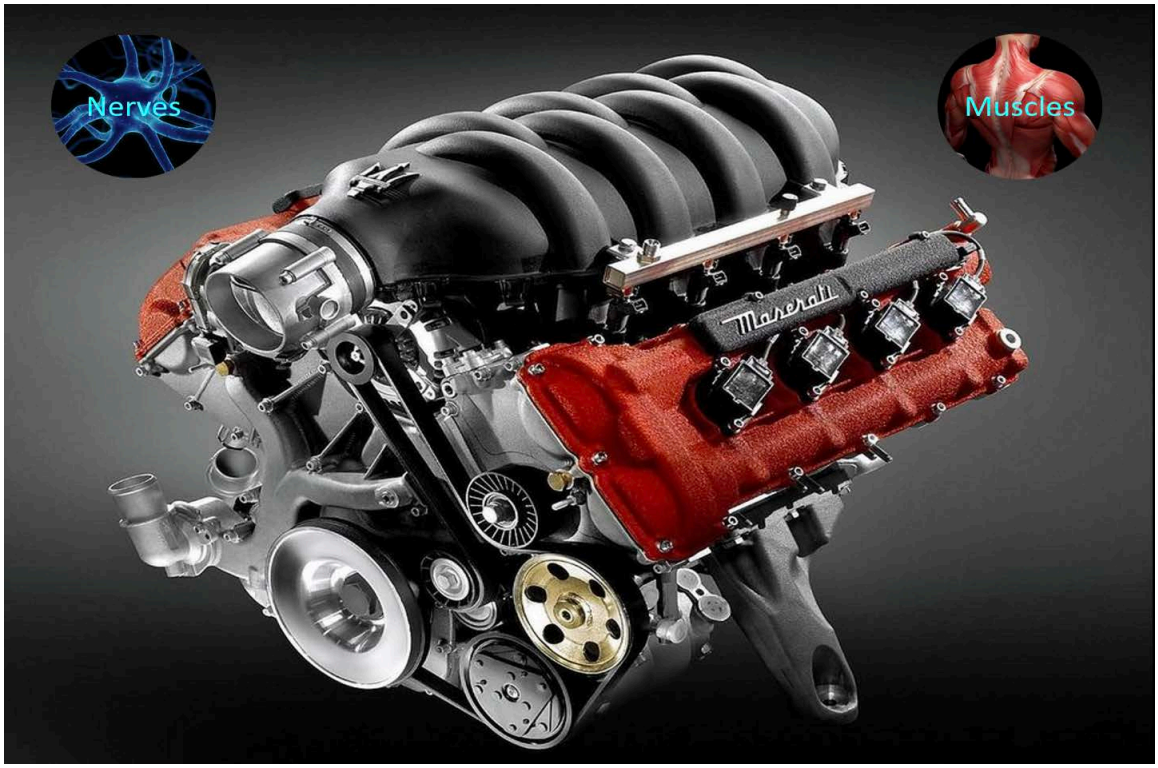


Nerves -> Muscles:

Fascia -> Nerves:

Muscles -> Fascia:

Neuromuscular System = Engine



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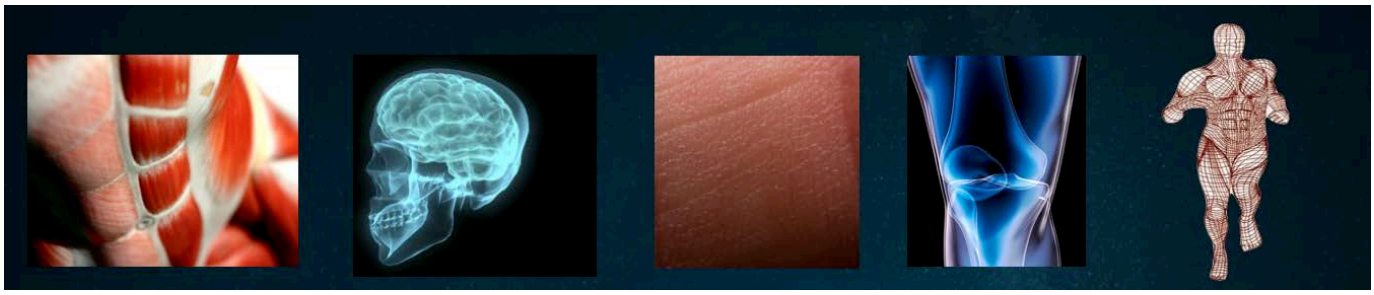
NOTES:

Fascia System = Chassis

NOTES:

How Load Affects Our Systems



Increases in load training _____

_____

Submaximal load training _____

_____

NOTES:

Strength Training

Muscular strength training _____

_____

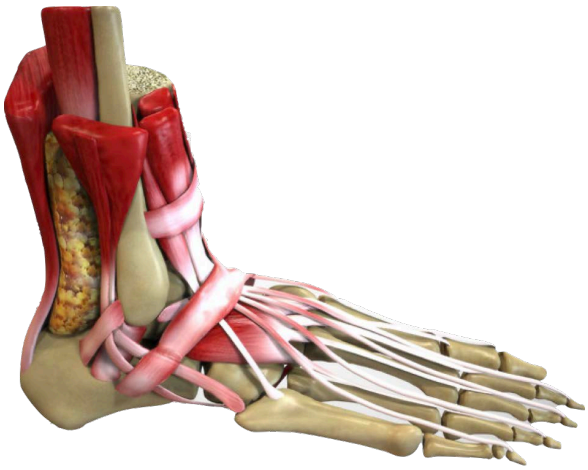
Movement strength training _____

_____

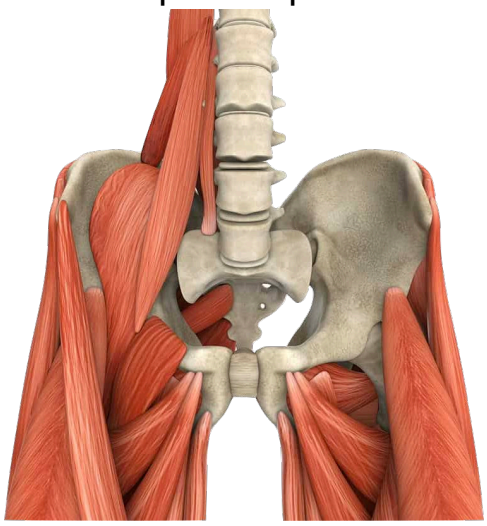
NOTES:

Anatomical Adaptation + Vector Variability

Foot/Ankle Complex



Hip Complex



NOTES:

Anatomical Adaptation + Vector Variability

Thoracic Spine

NOTES:

Periodization of Training Stress: Strength

Position _____

_____

Maximal _____

_____

Relative _____

_____

Explosive _____

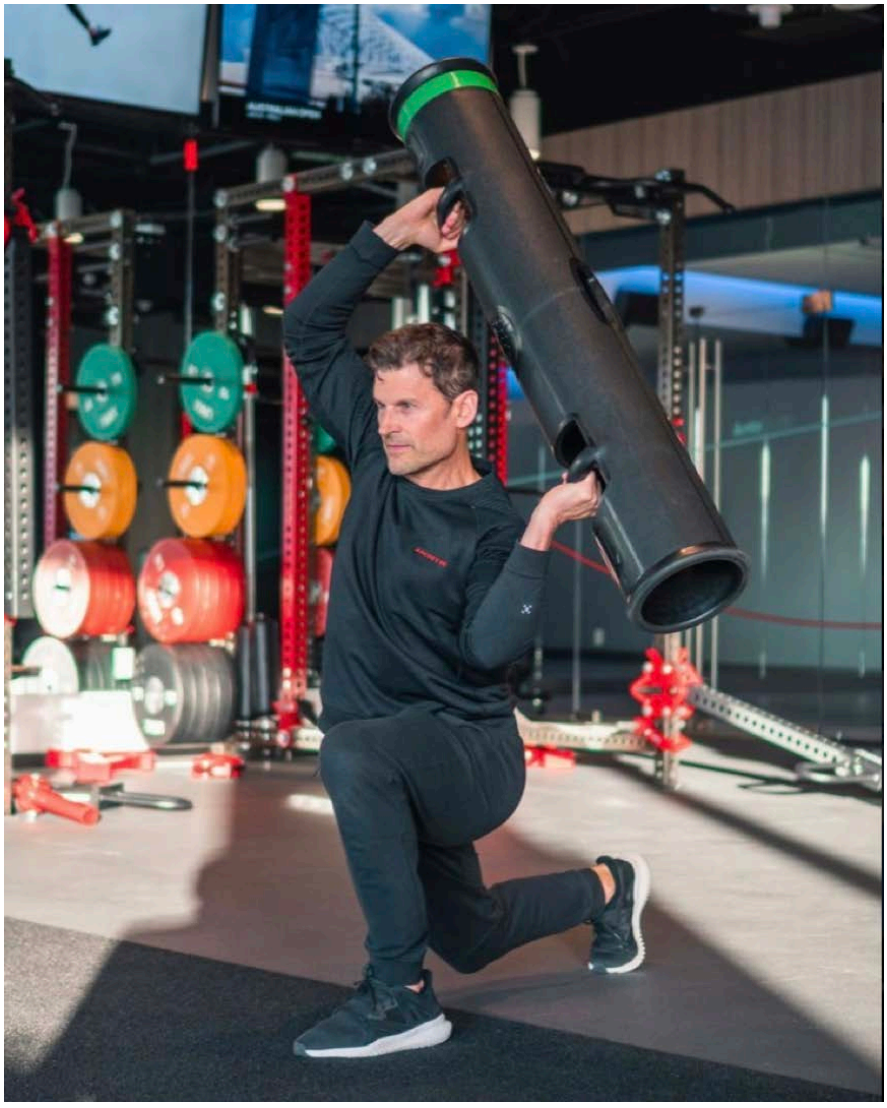
_____

Starting _____

_____

Agile _____

Odd-Position Strength



NOTES:

Periodization of Training Stress: Power

Acceleration_____

_____

Deceleration_____

_____

Conversion_____

_____

Speed, Agility & Quickness

NOTES: