TRAINING TENDONS:

PHYSICAL TRAINING, PERFORMANCE AND INJURY PREVENTION

“ Pushing performance is the outcome of the optimization of the musculoskeletal system and that actually puts athletes at an increased injury risk; as S&C coaches we should learn how to balance performance and injury risk”

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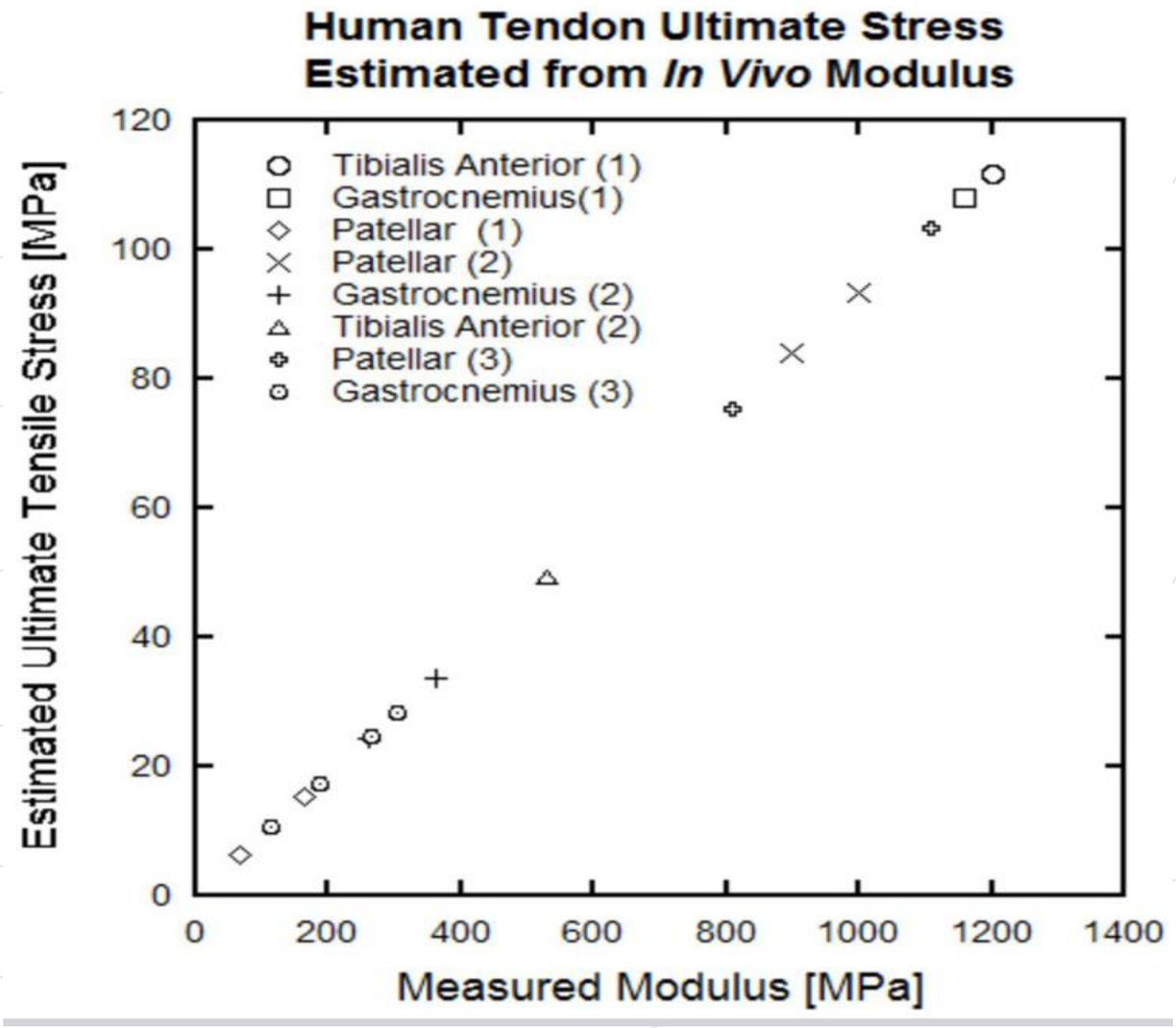
STIFFNESS AND FAILURE STRENGTH

95% of muscle is made of cellular material, tendons and ligaments are mostly made of extracellular material.
There is a lot of extracellular matrix that is mostly made of collagen.

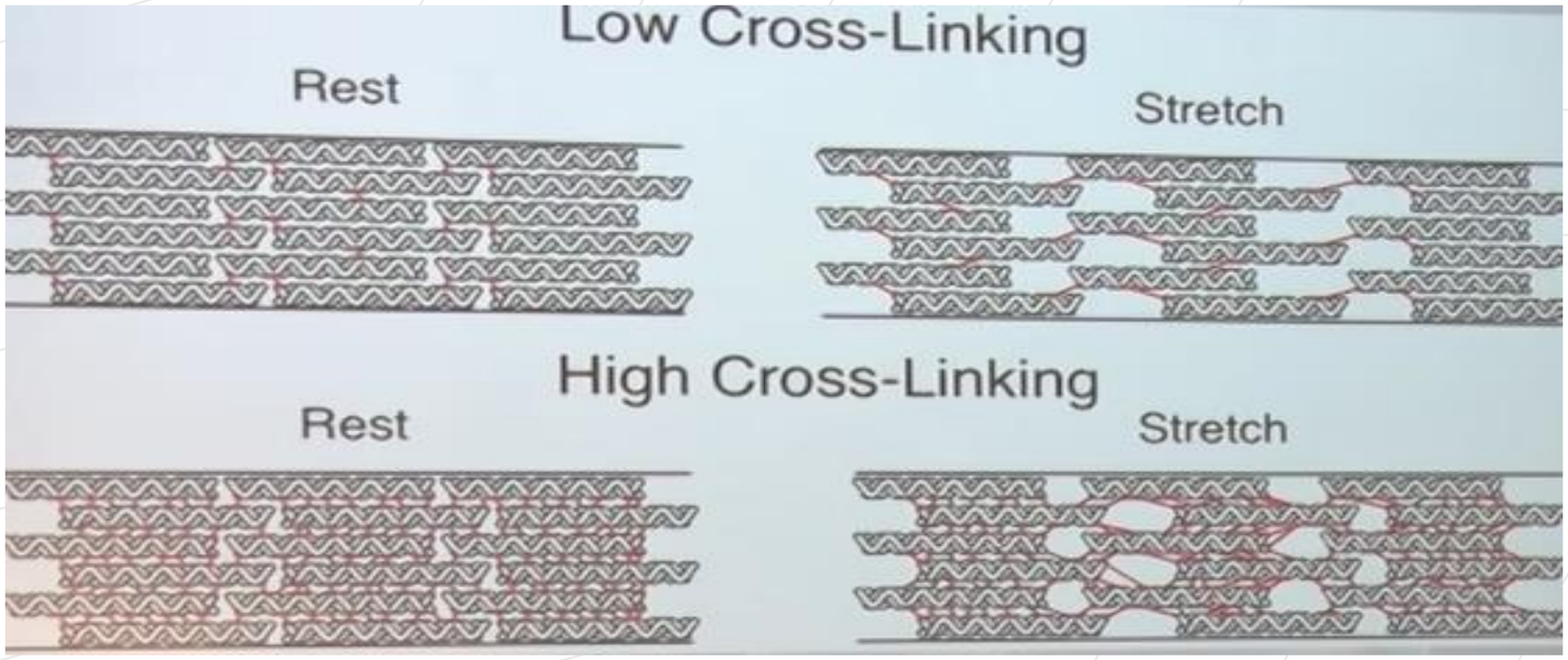


The stiffer the structure and the more energy it takes to break it and for ligaments that is great because it is going to decrease ACL ruptures because the knee joints are not lax.

REF: (5,6)

HOW TO MAKE CONNECTIVE TISSUE STRONG

LYSYL OXIDASE (ENZYME) → INCREASED COLLAGEN CROSS-LINKING



REF: (4,7)

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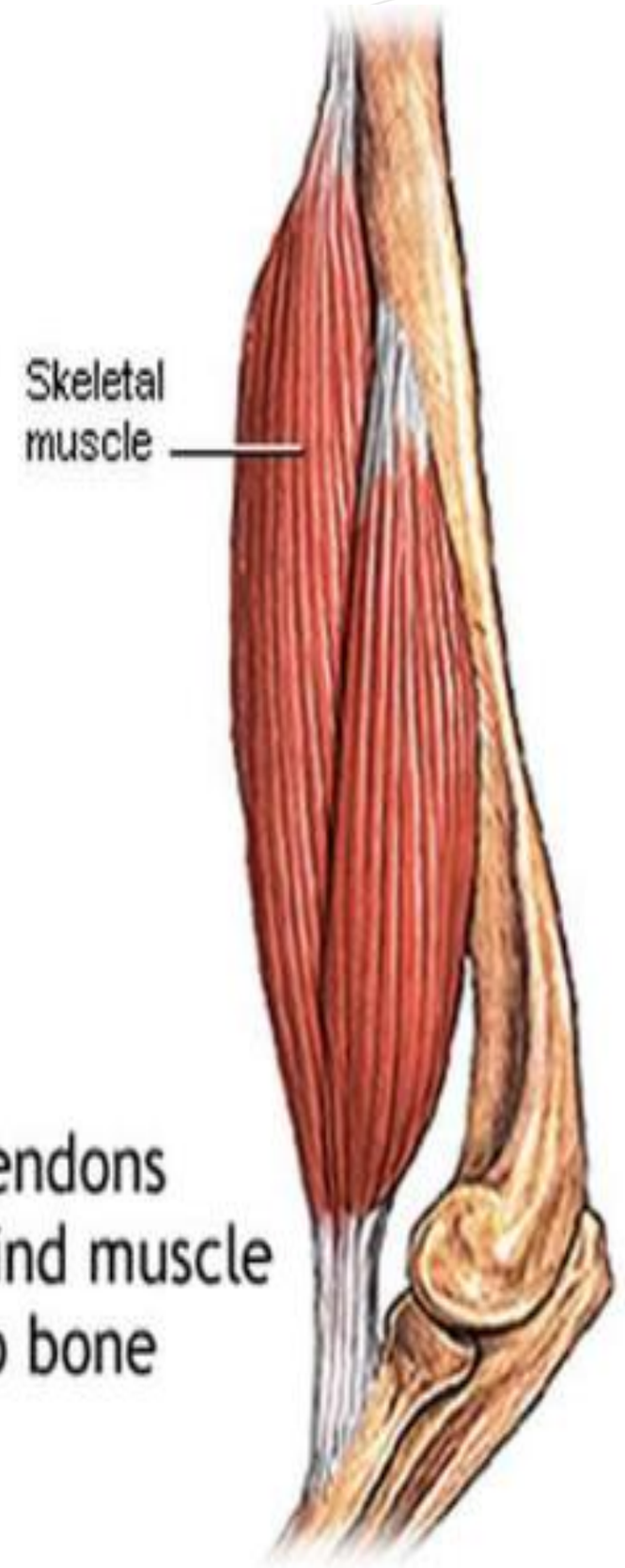
TENDONS

They bind muscle to bone: if we increase tendon stiffness too much, we are going to increase the risk of muscle injuries.

Tendons have visco-elastic properties: it mechanically behaves like an elastic material and like a liquid

Tendon extensibility is highest near the muscle and stiffer near the the bone



REF: (1,2,3)

TENDON FUNCTION FOLLOWING INACTIVITY

"Inactivity increases tendon stiffness due to the loss of compliance near the muscle"

QUICK MOVEMENTS

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ADD CROSSLINKS

↓

INCREASED STIFFNESS

SLOW AND HEAVY MOVEMENTS

↓

BREAK CROSSLINKS

↓

DECREASED STIFFNESS

REF: (1)

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TRAINING EFFECTS

Maximal exercise effect is seen after 5-10 minutes

It takes at least 6 hours to return to exercise sensitivity

TRAINING EFFECTS ON LIGAMENTS, TENDONS AND BONE ARE NOT FREQUENCY OR AMPLITUDE DEPENDANT

An intermittent training protocol is twice as effective as a continuous activity paradigm at increasing collagen synthesis in engineered ligaments.

Loading to optimize tendon health should be performed slowly against a heavy load for 5-10 minutes

REF: (3,8)

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