# TRAINING TENDONS:

#### THE FUNCTION OF THE TENDON IN

#### DYNAMIC MOVEMENTS

*"Tendons act as an elastic energy storage device to allow us to get more output from the muscles. They store energy and they allow an increase in energy return in order to get more propulsion for the same level of muscle contraction"* 



## TISSUE STIFFNESS AND STRUCTURAL ADAPTATIONS

*1. Tendon structure: Tendinopathies happen because of loss of tissue homeostasis (increase stress on the tissue with insufficient repair). What influences the repair process?* 

Adiposity

diabetes

genetic factors (they are the same genes involved in ACL ruptures and they are Collagen 51A and collagen degradation components MMP3).

2. Age: if an individual is older and inactive the tendons will deteriorate just like the muscles.

*3. Stiffness: There is not an optimal level of stiffness, stiffness is purely subjective and varies with every individual.* 





### IS ISOMETRIC TRAINING EFFECTIVE?

*The literature suggests to use isometric contractions to control the stress very specifically during a rehab phase. Ex. In track and field they use very heavy isometric for performance for very high muscular voluntary contractions (at least 85% of MVC).* 

*In the first phase of rehab we will use isotonic contractions (ex. Bilateral heel raise, unilateral heel raise):* 

- "the strength of the plantar flexors was identified as a predictor for an achilles tendon overuse injury, with subjects having a lower plantar flexor strength at greater risk. REF: (2)
- individuals with achilles tendinopathy had deficits in plantar flexor strength and endurance on BOTH sides with weakness of the soleus appearing to be responsible for the majority of the deficits. REF:(4)



#### TENDON BUFFERING

*"Muscles dissipate energy when they actively lengthen, and energy dissipation is required for any activity involving the deceleration of the body or limbs, including quick maneuvers, reducing speed in walking or running, or in landing from a jump."* 



*Tendons act as a mechanical buffer to protect muscles from possible damage associated with rapid active stretching* 

*Energy is initially absorbed by the tendon during a brief and rapid event, followed by a relatively slow flow of energy from the tendon to the muscle as fascicle lengthen and dissipate energy.* 

Studies have shown that tendons delay and reduce energy absorption by active muscle fibers, allowing for slower, less powerful, and lower force contractions.

(REF:8)



## ABSORBTION AND DISSIPATION

During **lengthening** contractions, muscle fascicles predominantly shorten while the whole muscletendon unit (MTU) lengthens.





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