

**ATFL
Ligament tear
Grade 2 by
Neil Edwards**



Forces ligaments endure and when they fail.

A ligament works when it is under tension (Marieswaran, et al 2018).

A ligaments job is protection at end of range (Arkel et al, 2018).

Ligaments have a high amount of elastin (Jacob et al, 2021).

A ligament has to be fully lengthened for it to fail (Chen et al, 2019).

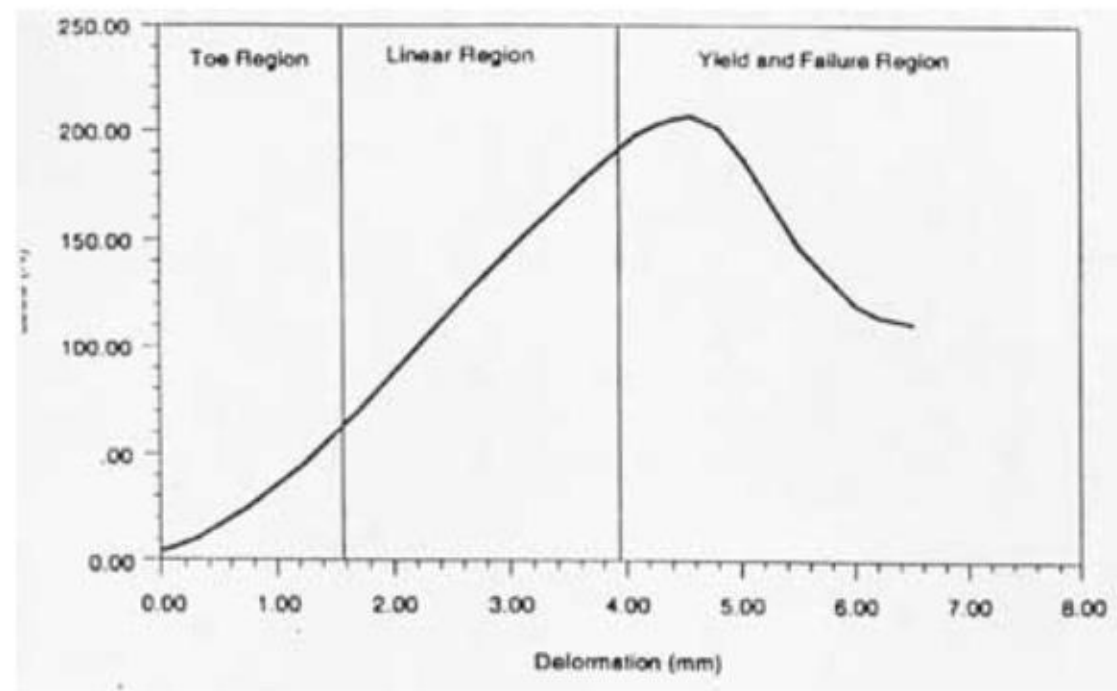
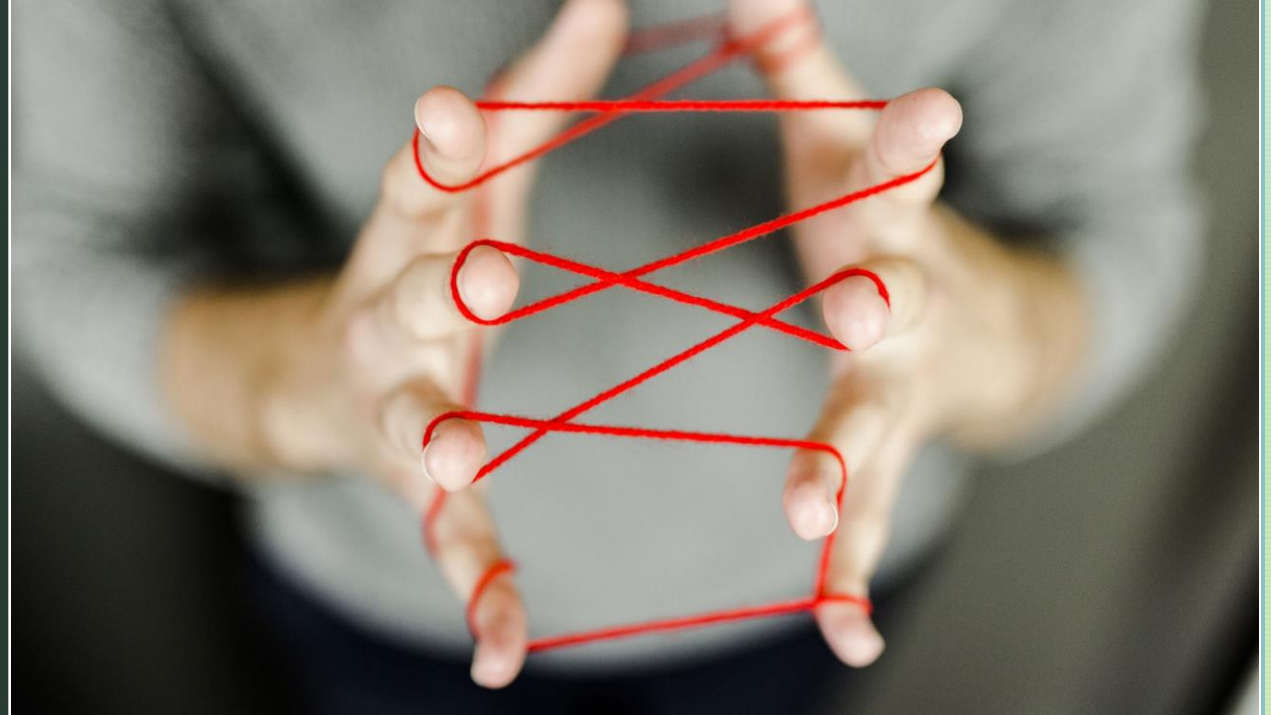
A slight tear creates energy that escapes and makes ligament more vulnerable to tear further (Hirschmann et al, 2018)

Ligament is stiff at end of range (Arkel et al, 2018)

Ligament stiffens to prevent joint dislocation (Arkel et al, 2018)

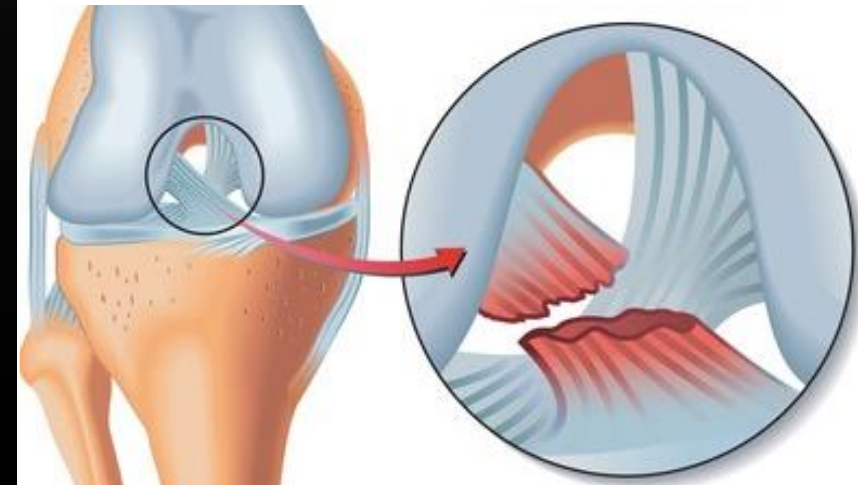
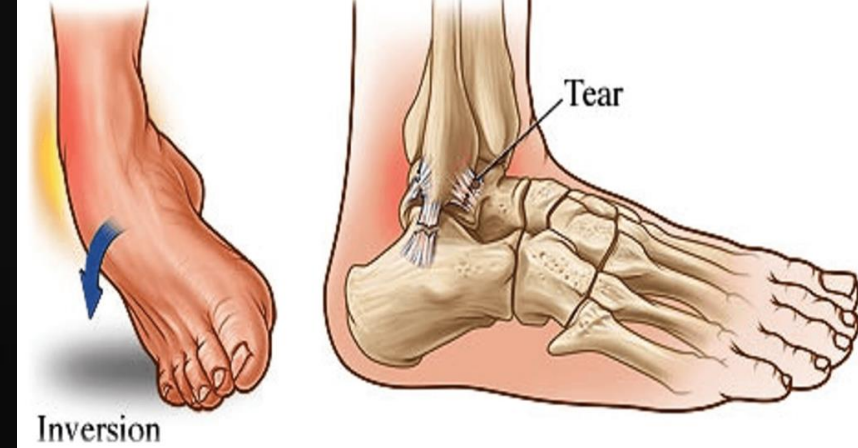
Stress strain curve of the ligament

- Ligaments are designed to stretch; but they have a limit (Henninger et al, 2019).
- If taken beyond elasticity it may not cause injury but lengthen ligaments permanently, which causes laxity at the joint (Scott et al, 2020).
- STRAIN - the amount of force being used, putting tension on the ligament.
- STRESS – stress of the fibres within the ligament, when enough of them break that's when the ligament tears.
- With the ligament, you can see that crimp is removed within the collagen fibres at around 1% when elongated. The collagen fibres fail at around 4% of elongation.



Types of injury that occur in the ligament tissue and length of time for healing.

- Grade 1 is a mild tear and may sometimes not even be a tear; with healing typically 2 weeks
- Grade 2 moderate pain, swelling, some movements may cause instability, takes 6 months to heal.
- Grade 3 Lack of pain, joint instability, notable bruising and swelling, takes 12 months to heal. Need surgical intervention.



LATERAL COLLATERAL LIGAMENT INJURY

Forces that can be applied to rehab a ligament injury and what can cause re-injury?

An injured ligament loves to be loaded, even at early stages

Dorsiflexion is reduced with ligament injury at the ankle

A ligament hates to be stretched when sprained.

A ligament at the ankle will be irritated when ankle goes into inversion or eversion.

Isometric exercises help early stage of rehab.

Anterior talofibular ligament sprain/exercises for LAS

Calf raise off step holding for 20 seconds with 10 second intervals, 3 sets.
(strength) Progression (calf raise with exercise ball between calf's)
Regression (lying in supine putting ankle into plantarflexion with no resistance. (early stage)

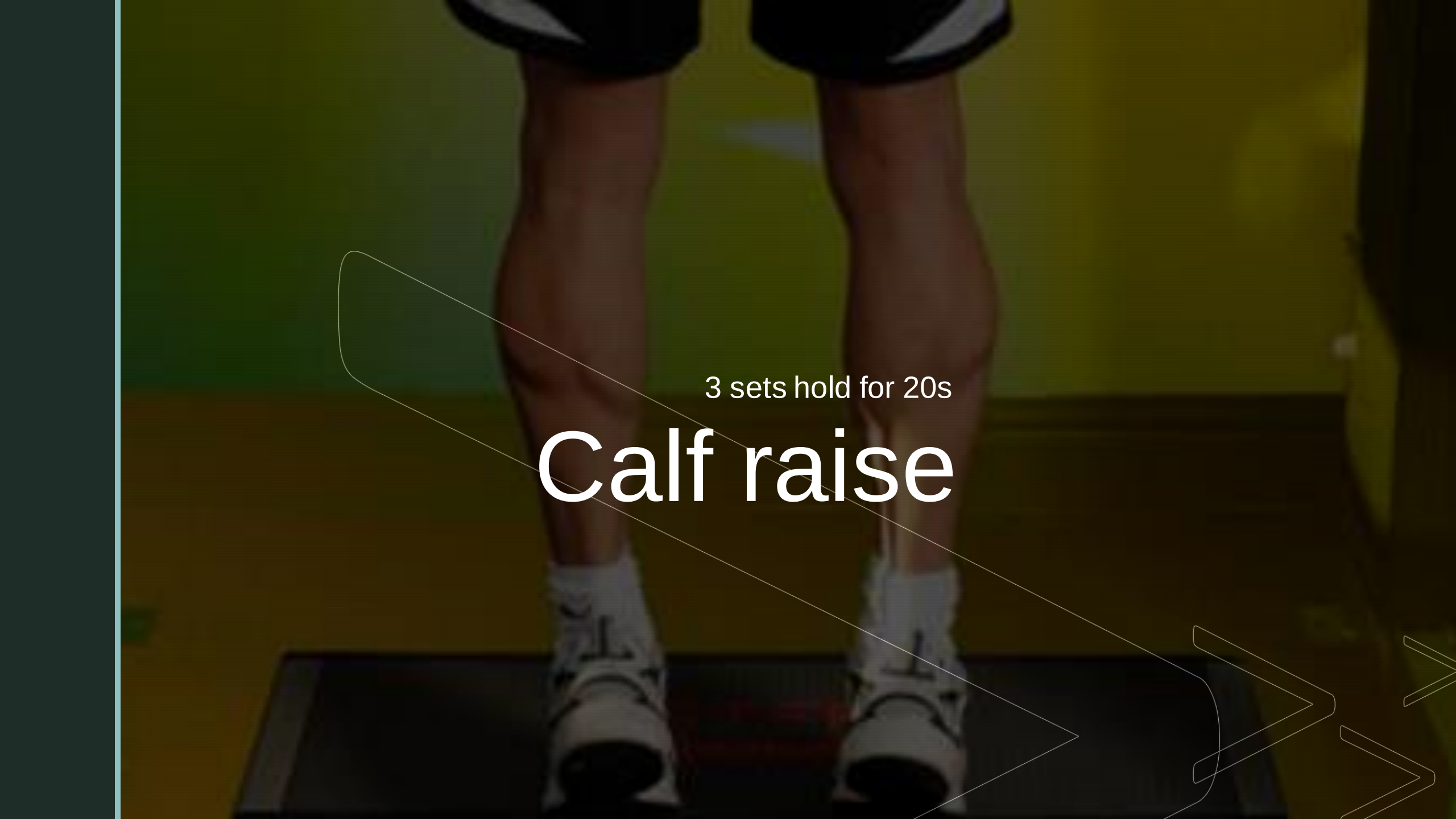
Knee to wall, hold for 20 seconds, 10 second intervals, 3 sets moving foot further away each time. (ROM)
Progression – using a band.
Regression - moving foot closer to wall. (may perform this half way through rehab)

Side step (band around foot) (30s) 1/1 glutes engaged and using outside shin muscles.
Progression – do the same in a squat position and move band up above ankles. Regression – sitting band around feet, Patient evertng foot.

Resistance band, pulling feet into dorsiflexion (ROM) (early stage) Progression - bringing foot into dorsiflexion without help of the band.
Regression - the therapist or trainer pushes ankle into dorsiflexion.

One legged calf raise on injured ankle, 3s x 8r (strength).
Progression- on uneven surface.
Regression – double leg calf raise (later stage)

Single leg bridge (with band around thighs, just above knees)
Progression – patient holding a ball out in front whilst performing exercise Regression - without band.

A person is shown from the knees down, performing a calf raise on a dark step. They are wearing black shorts, white socks, and white sneakers. The background is a blurred indoor setting with green and yellow walls. The image is overlaid with a dark green semi-transparent layer. A thin white line starts from the left, curves around the text, and extends towards the bottom right. In the bottom right corner, there are several white geometric shapes, including a large 'V' and some parallel lines.

3 sets hold for 20s

Calf raise



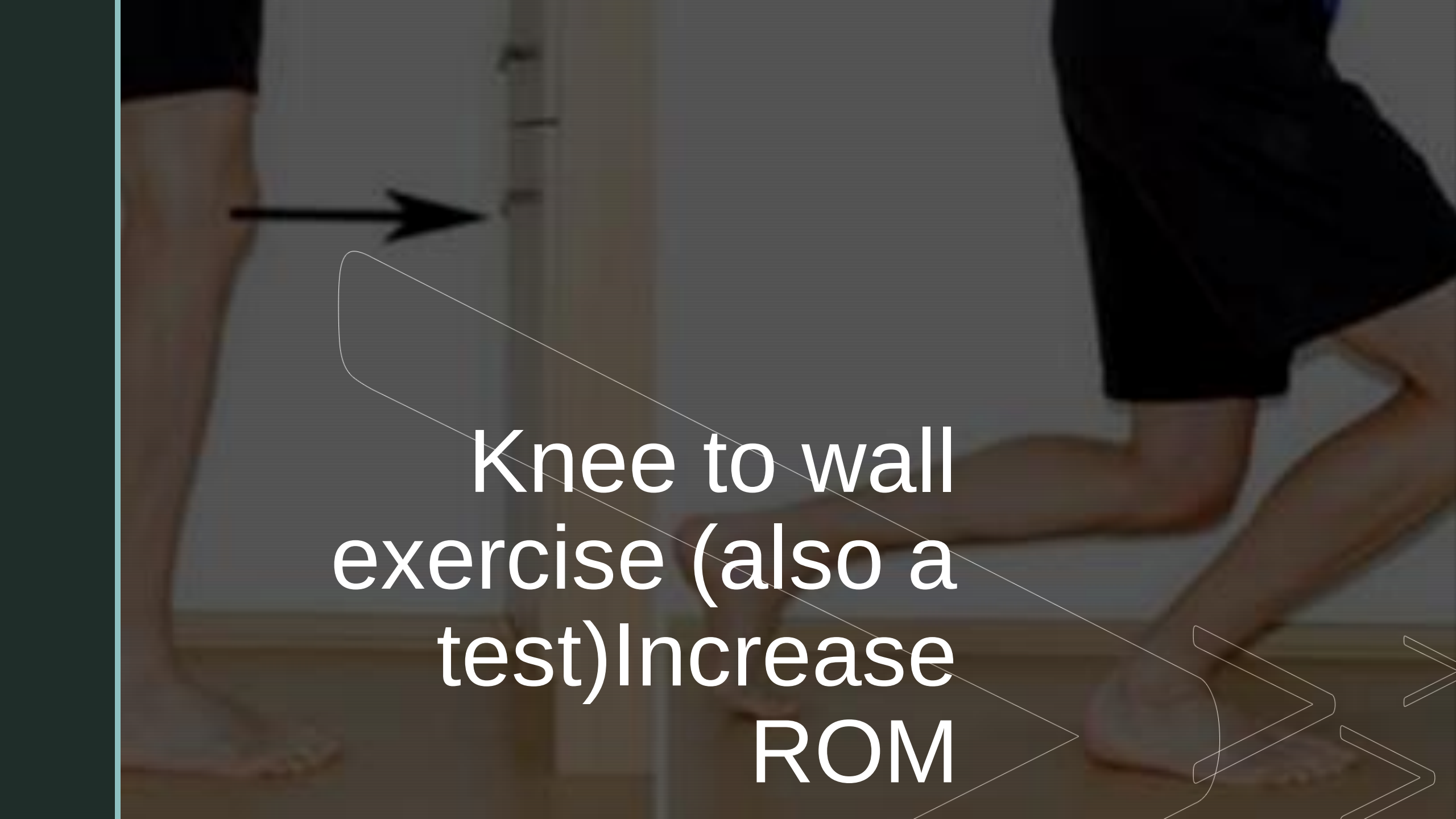
Progression of the calf raise

Ball in between legs

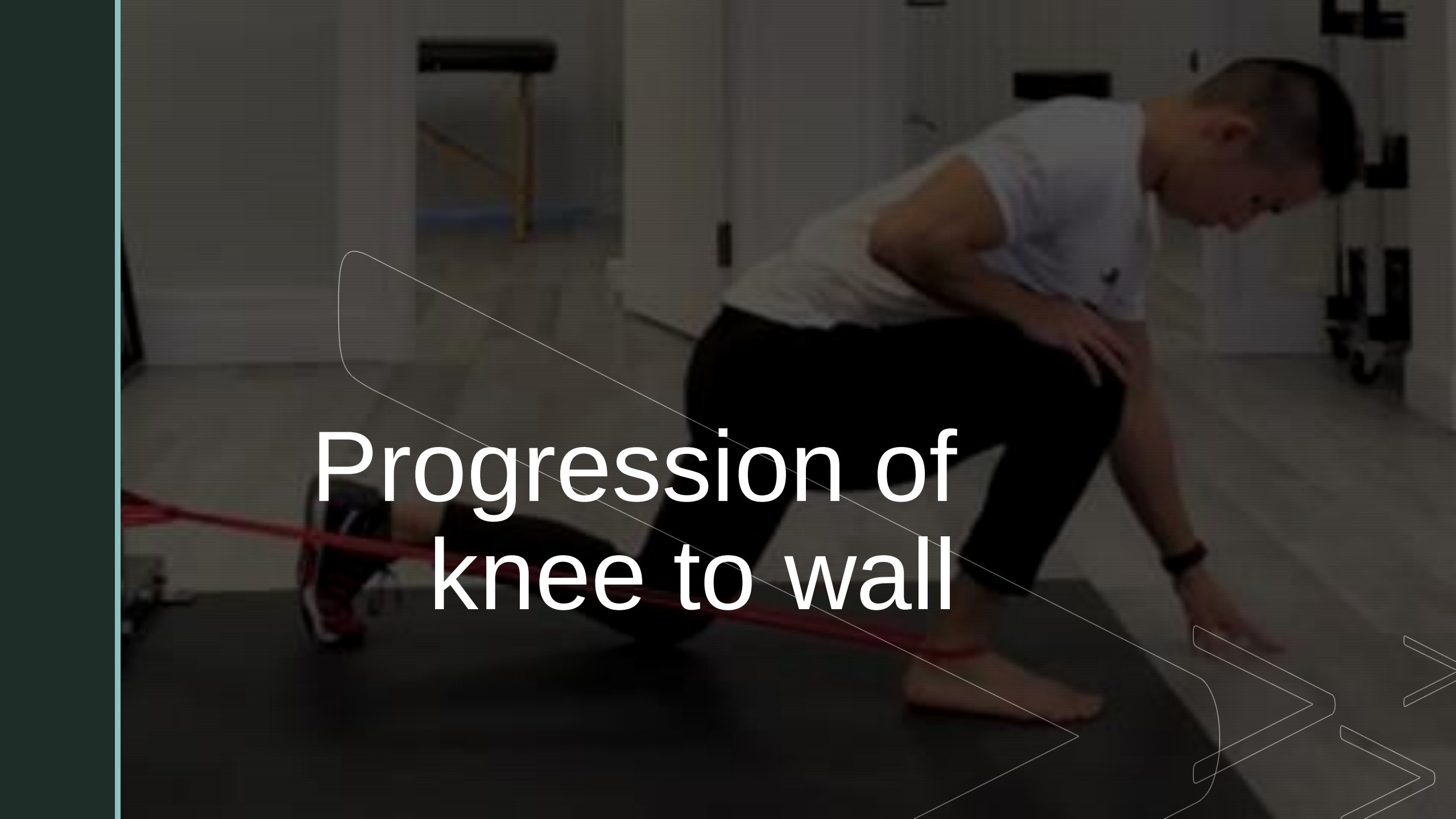
3x20 secs 10sec interval

A person is shown from the side, performing a calf raise. They are standing on a green exercise mat. Their right foot is flat on the mat, while their left foot is raised and resting on a rolled-up light blue towel. A black arrow points from the heel of the left foot towards the back of the heel, indicating the direction of movement. The person is wearing a grey athletic top. The background is a plain, light-colored wall.

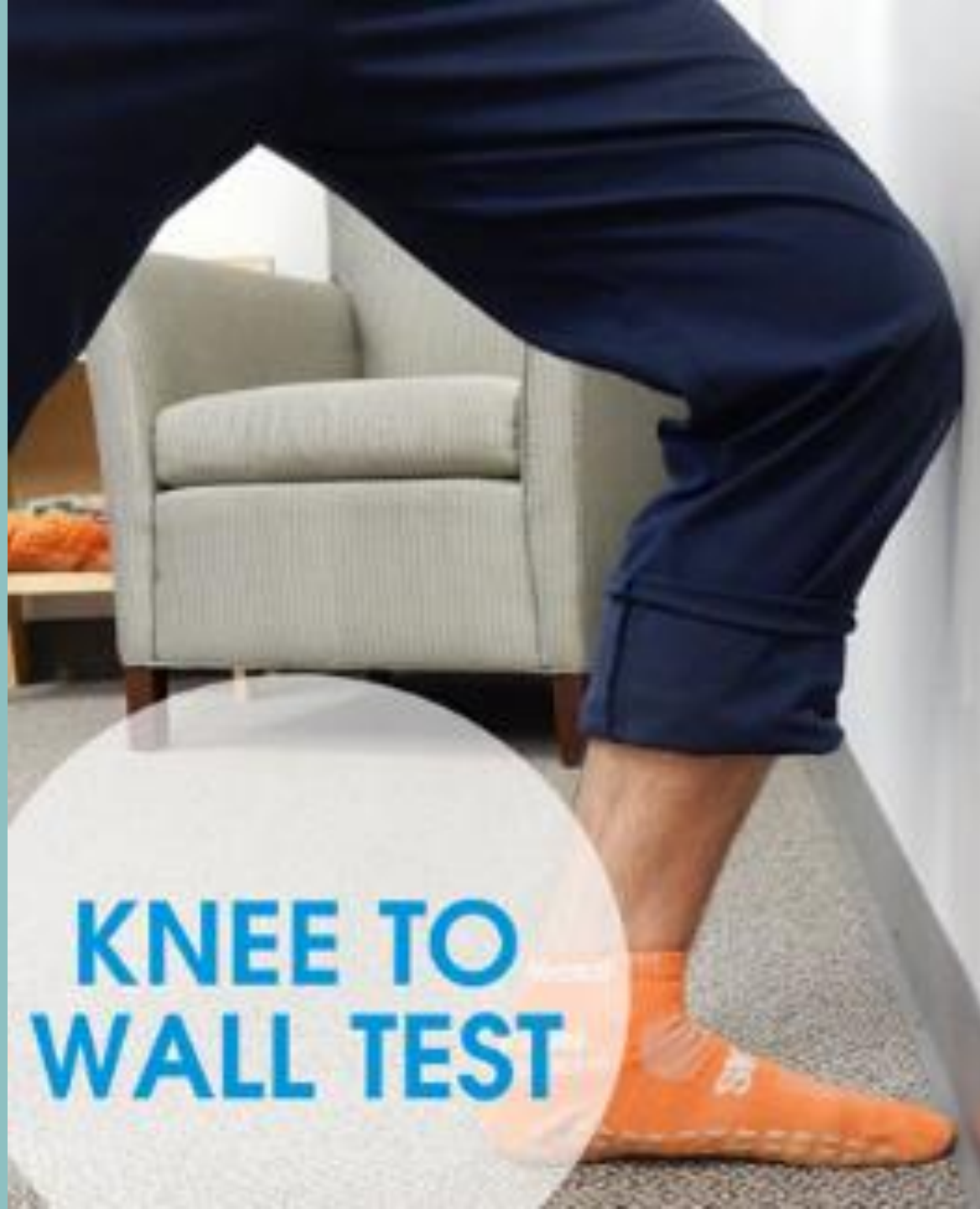
Regression of calf raise 3x30s



Knee to wall
exercise (also a
test) Increase
ROM

A man in a white t-shirt and black leggings is performing a resistance band exercise in a gym. He is in a low, athletic stance, leaning forward with his hands on the floor. A red resistance band is looped around his right foot and extends towards the left. The background shows gym equipment and a white wall. The text "Progression of knee to wall" is overlaid in white, with a white line graphic element above it and several white chevron-like shapes in the bottom right corner.

Progression of knee to wall



Regression of the knee to wall test

- Foot is moved
closer to the wall



Side step
band around
feet
1 set 30secs



Progression of side step with band

- Side step in a squat position

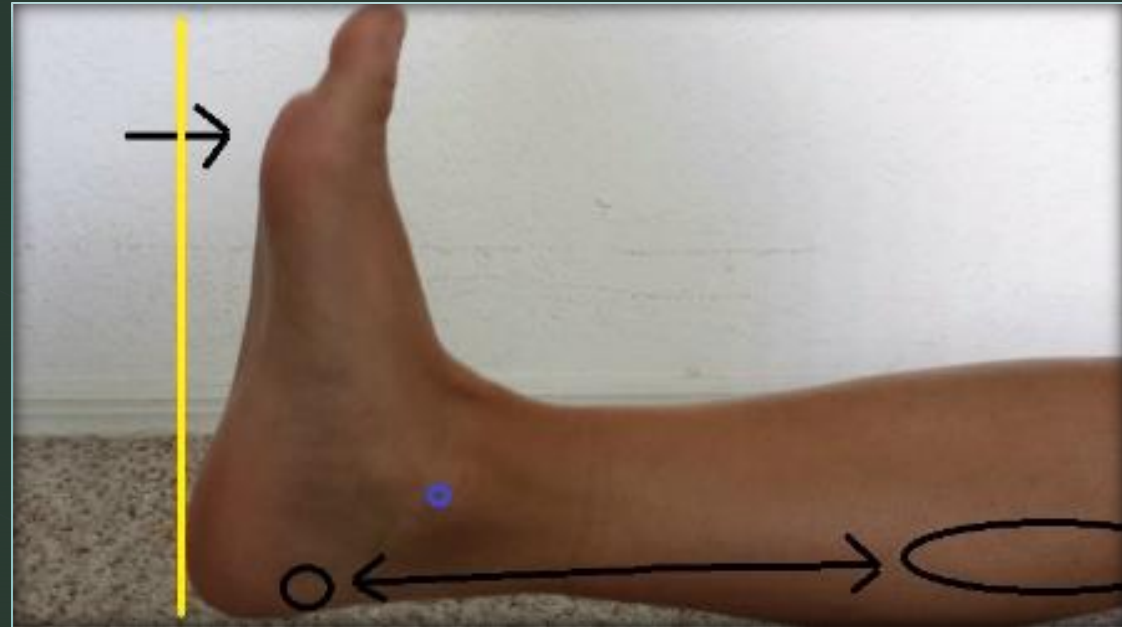


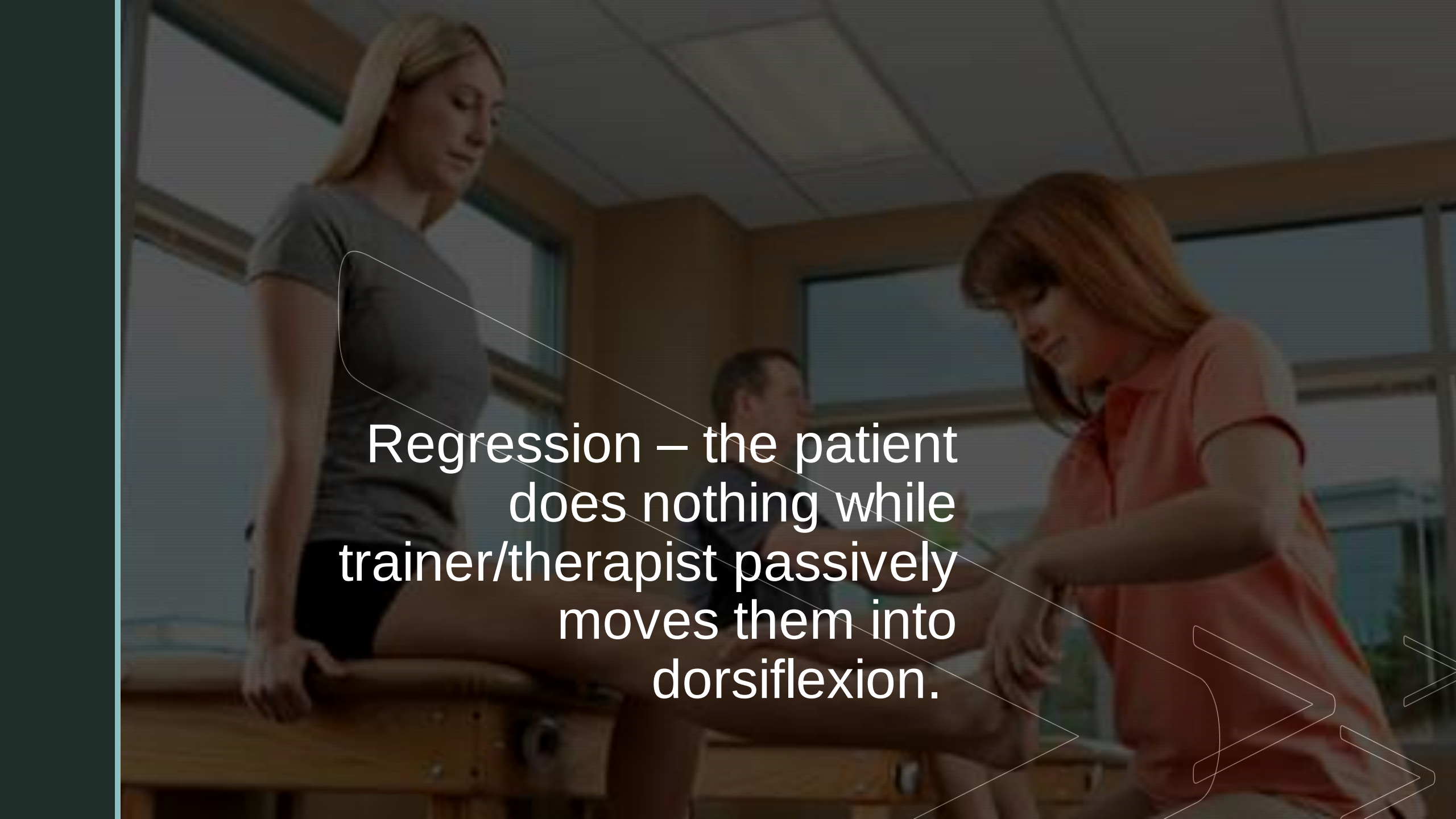
Regression of side step with a band

Pulling toes
toward shin,
passive
dorsiflexion.



Progression -
Active dorsiflexion





Regression – the patient
does nothing while
trainer/therapist passively
moves them into
dorsiflexion.

One legged calf raise



Progression

- Calf raise on uneven surface



Regression

- Double leg calf raise





Single leg bridge

Progression



Regression



➤ Mechanotherapy and tissue mechanics



Mechanotherapy is a non-aggressive way to rehabilitate the ligament such as loading it when injured to build new fibres in the structure of the ligament.



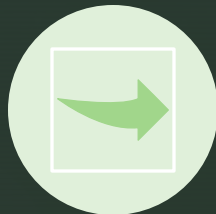
Using calf raises helps in rehabilitation.



A ligament thrives when loaded.



Loading the ligament helps build new fibres in ligament tissue.



Tissue mechanics, Anterior tibialis becomes tight.



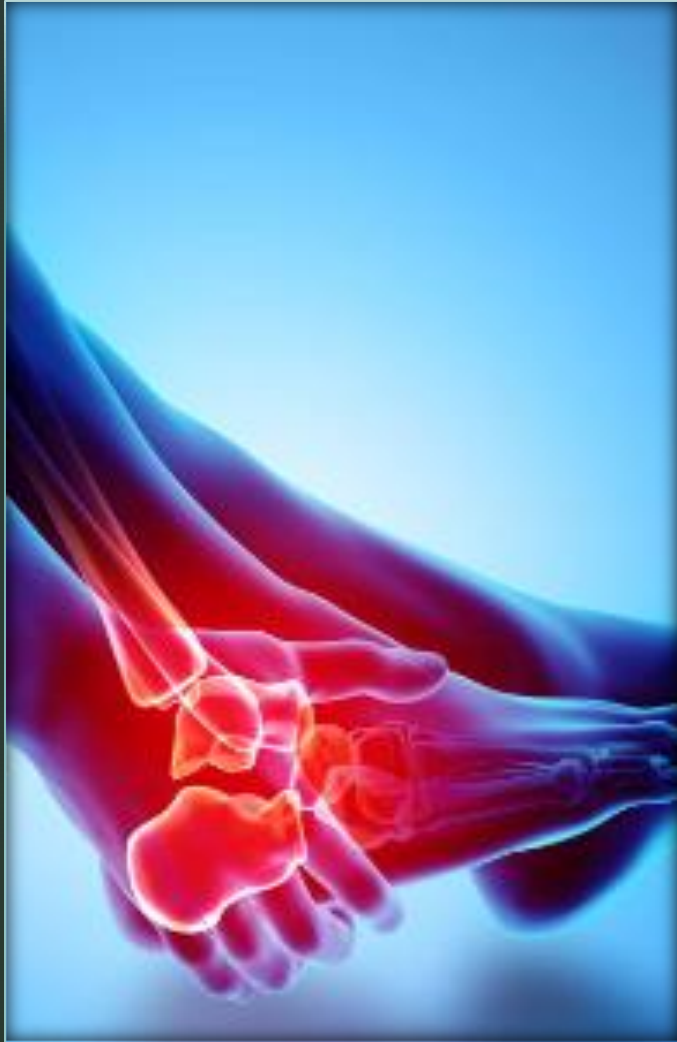
Gastrocnemius becomes overworked along with soleus.



Tissue healing

- Grade 1 - tear can take 14 days or less for return to play
- Grade 2 - tear can take 3 weeks to heal
- Grade 3 - can take 3 to 6 months

Joint arthrokinematics



- There will be laxity at the ankle following a LAS (lateral ankle sprain)
- Ankle may be swollen after injury causing lack of movement, dorsiflexion and inversion/eversion will be lost
- There will be a giving way when weight bearing such as when patient walks
- There will be a lack of dorsiflexion in particular
- Calf would become tight and overused trying to keep off the injured limb
- Achilles tendon could be irritated
- Anterior tibialis issue from muscle being unused as a result of pain
- Continuing to load ligament will bring it to repair
- Continuing ankle rehab program will slowly build ligament and aid recovery

RANGE OF MOVEMENT

- Active – There would be pain on dorsiflexion and limited range. Plantarflexion would be easier but may be pain present. Inversion will be limited and painful. Eversion would be limited and painful.
- Passive - 'End feel' may feel capsular because of inflammation/swelling in dorsiflexion

PEACE & LOVE

P



PROTECTION

Avoid activities and movements that increase pain during the first few days after injury.

E



ELEVATION

Elevate the injured limb higher than the heart as often as possible.

A



AVOID ANTI-INFLAMMATORIES

Avoid taking anti-inflammatory medications as they reduce tissue healing. Avoid icing.

C



COMPRESSION

Use elastic bandage or taping to reduce swelling.

E



EDUCATION

Your body knows best. Avoid unnecessary passive treatments and medical investigations and let nature play its role.

&

L



LOAD

Let pain guide your gradual return to normal activities. Your body will tell you when it's safe to increase load.

O



OPTIMISM

Condition your brain for optimal recovery by being confident and positive.

V



VASCULARISATION

Choose pain-free cardiovascular activities to increase blood flow to repairing tissues.

E



EXERCISE

Restore mobility, strength and proprioception by adopting an active approach to recovery.

Isometric

Isometric calf raise



Isometric plantarflexion sat on a chair



Isometric eversion sat down



Isometric plantarflexion against wall (toes against wall)



Concentric exercises for LAS

- Ankle pumps



Squatting and weight shifting with dumbbell



Concentric calf raises



Concentric proprioception exercise



■ Eccentric exercises
Calf raise (lowering self slowly from a calf raise)



One legged eccentric calf raise



▸ Tibialis anterior
resistance band
eccentric exercise



Reactive drills, choose colour and jump to colour



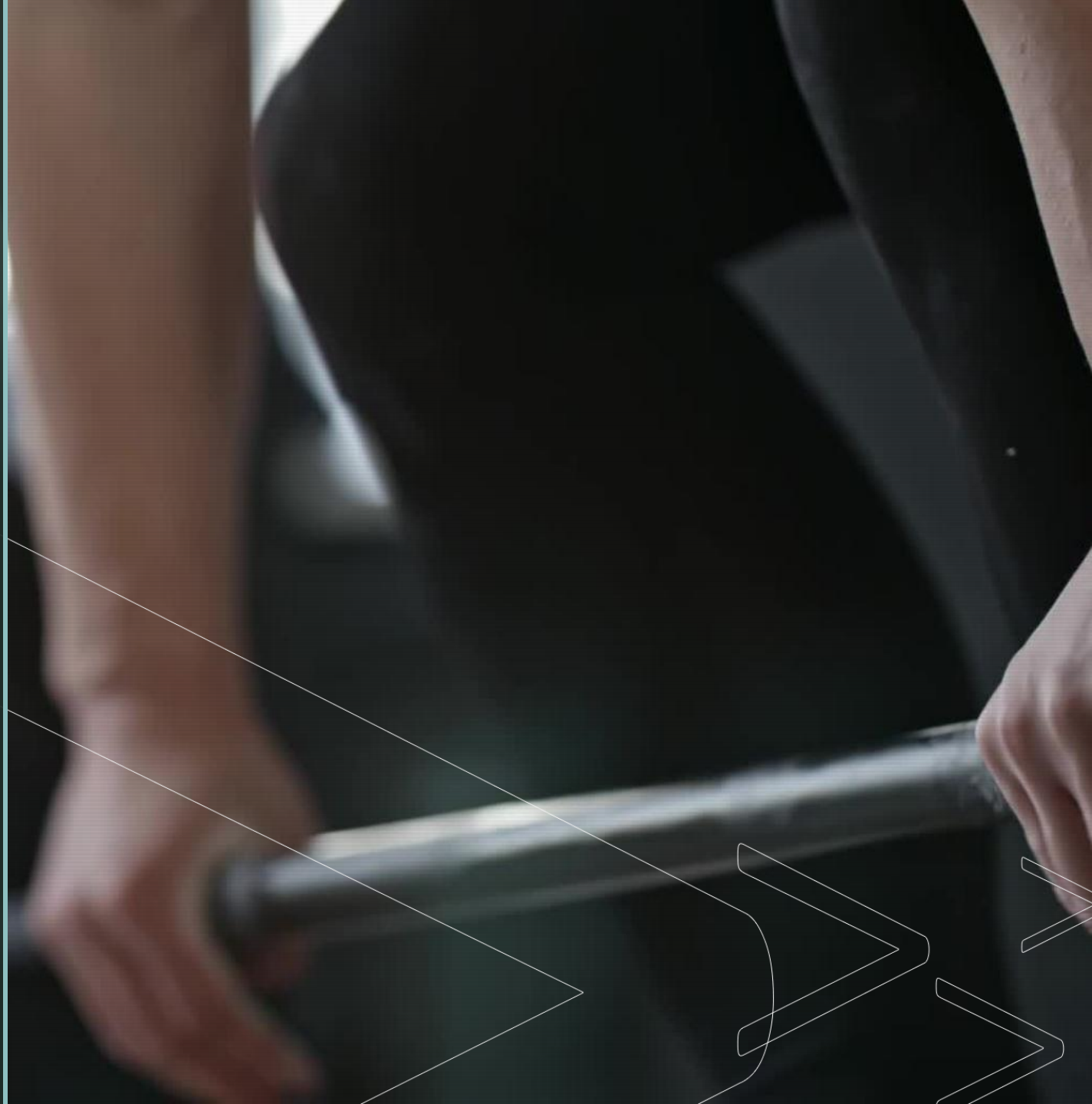
Muscle strength endurance

- Having good muscle endurance helps prevent injury
- Showing patient exercises that will give them muscle endurance will help prevent future injuries.
- Muscle strength endurance helps rehabilitation for ATFL sprains



Muscular strength

- The therapist may look to strengthen anterior tibialis to improve dorsiflexion
- The therapist will look to strengthen gastrocnemius and soleus
- Tibialis posterior may also be considered
- Strengthening quadriceps will help
- Strengthening tibialis anterior



HYPERTROPHY

- Hypertrophy plays an important role in the rehabilitation of soft tissue injuries through strengthening muscle and progressing its endurance.
- Hypertrophy is helpful post injury.
- Muscle hypertrophy refers to growth of cells triggered by strain on muscles from training or exercise.



POWER

Muscle atrophy will occur in most cases of an injury so patient would lose power in injured limb as a result of not using it as much as he or she would normally use it (Mansur et al, 2022).

Agility

According to Abassi et al, (2019) In a lateral ankle sprain, the joint becomes less agile, all movements are effected in an LAS but plantarflexion and dorsiflexion are most effected in comparison to inversion and eversion (Abassi et al, 2019).

Functional movement screening is a great tool for testing athletes agility, performance and speed (Liang et al, 2019).

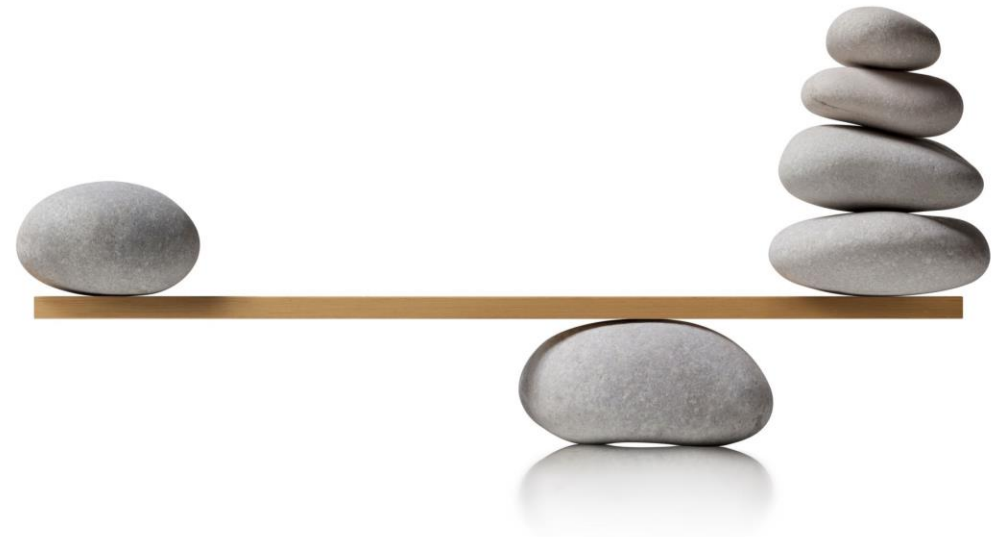
Improving the athletes agility is important, using the FMS tool to show if there is improvement will be useful for the trainer/therapist (Dallam et al, 2019).

Agility is also considered in regards to change of direction when running such as sports like football, in a lateral ankle sprain, agility is lost as dorsiflexion is diminished as well as inversion and eversion of the ankle (Peric et al, 2021).

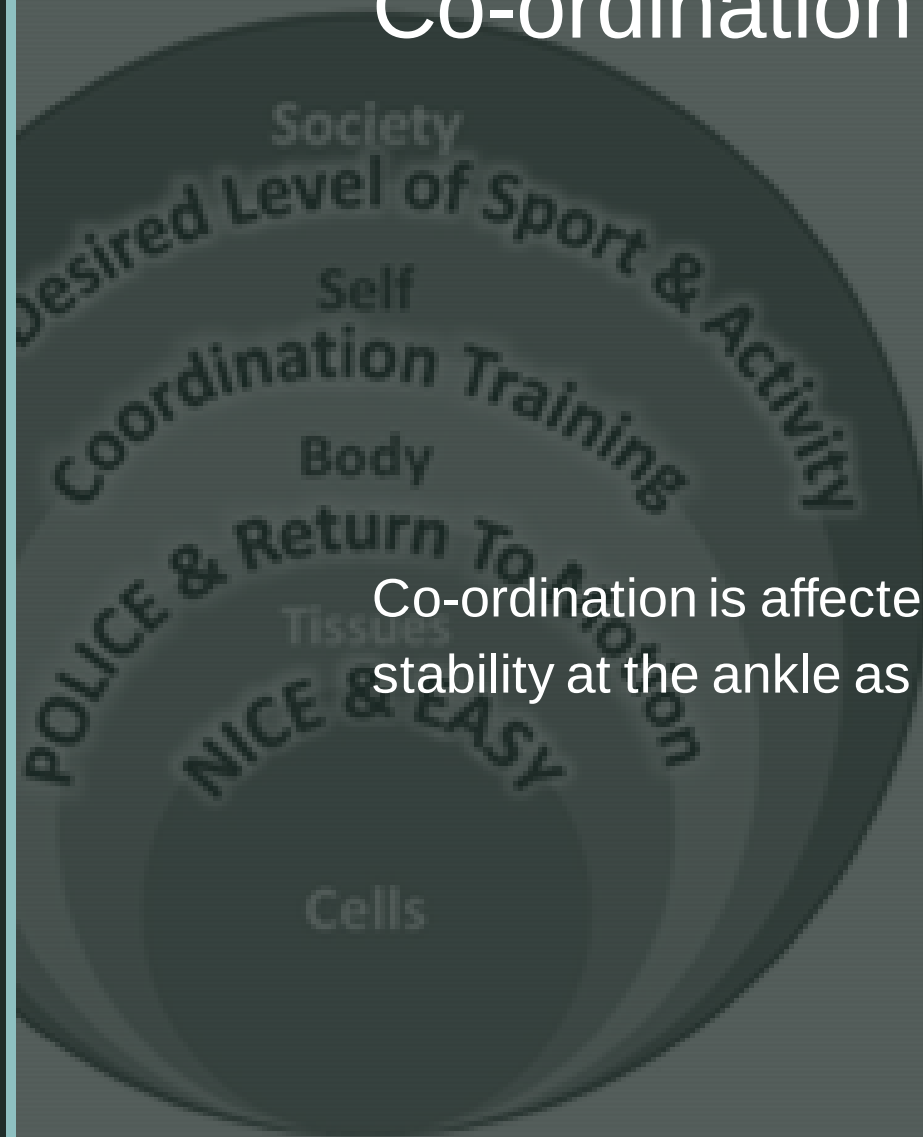
Balance

Balance is affected because ligament has tear causing instability at the ankle.

Athlete will over compensate by putting more pressure on other leg creating muscle imbalance affecting balance.



Co-ordination



Co-ordination is affected in a LAS because the athlete has lost stability at the ankle as fibres have torn in the ligament

Return to Desired Level of Sport & Activity

Requirements: Enhance perception of self in the context of their societal role.

Integration of self into a unified society

ICF Goal: Return to Participation

Coordination Training: Influence perceived ability, self-efficacy, and resilience in functional activities

Integration of the body into a unified self

ICF Goal: Return to Functional Activity

POLICE & Return to Motion: Enhance perception of body tissues integrated in body movements

Integration of cells into the component health of tissues & organs

ICF Goal: Enhance Structure & Function

NICE & EASY → POLICE: Control both mechanical and chemical stimuli for appropriate perception of cell and tissue function via *mechanotransduction*.

ICF Goal: Restore Structure & Function

Proprioception

Proprioception is affected in a lateral ankle sprain because articular mechanoreceptors are damaged affecting the proprioception of the athlete (Alghadir et al, 2020)

Preventing deconditioning

Whilst athletes spend time in the treatment room and are out injured for a period, it is important they don't fall into idleness and slack off with rehabilitation and then gain weight and be prone to another injury. Loading the injured ligament is key for it to improve and restore player to full fitness (Short et al, 2022).



Exercise selection & prescription

Exercise selection and prescription needs to be specific to the patient. There is no use putting the whole team on the same rehab plan when they are all different shapes and sizes and have differing strengths to one another (Bak et al, 2023).



Exercise programming

- Prevention programs can be used after recovery to prevent injury and this can be used alongside regular exercises the athlete is involved with.



Assistive devices for non/partial weight bearing

- A boot or brace may be used for a LAS, therapist could maybe even give crutches although loading the ligament is more affective.
- Load sensors are useful in determining if athlete is likely to reinjure tissue again as if it is weaker on the one side after recovery of the tissue, this is prone to being injured again.

Surgical & conservative management methods

SURGERY In a complete rupture of a ligament, surgery is needed. If surgery can be avoided it should be avoided as more issues can arise as a result of surgery such as scar sensitivity, DVT or sensory loss (Liu et al, 2019)!

CONSERVATIVE Using a conservative route instead will not cause contra-actions as therapist is letting patients body do the work (Liu et al, 2019).

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