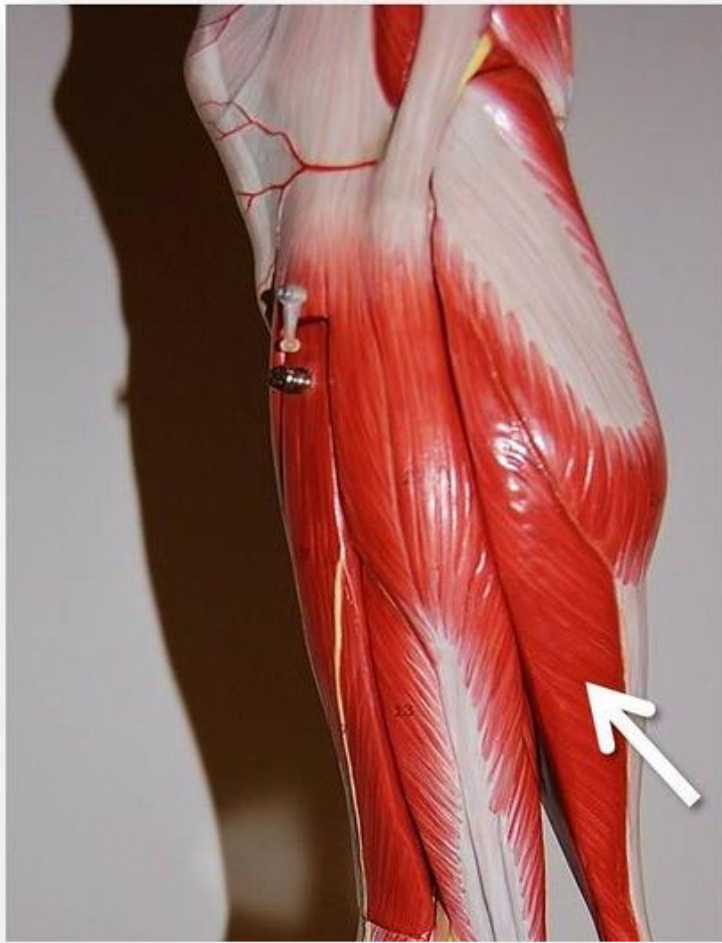


# Soleus



## Muscle Tissue Failure and Rehabilitation: Soleus

Cynyr Llewelyn-Jones. 2404670. BMST5003

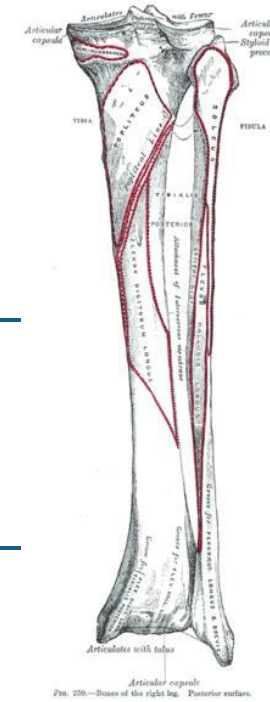
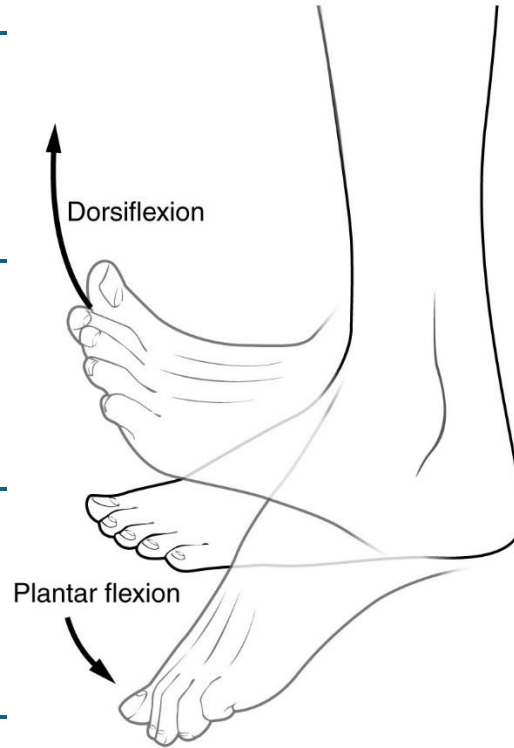
# Anatomical Profile Of soleus

# Origin

# Insertion

# Action

# Nerve supply



(Radiopaedia)

(Wikipedia)

(Brookbush Institute, 2026)

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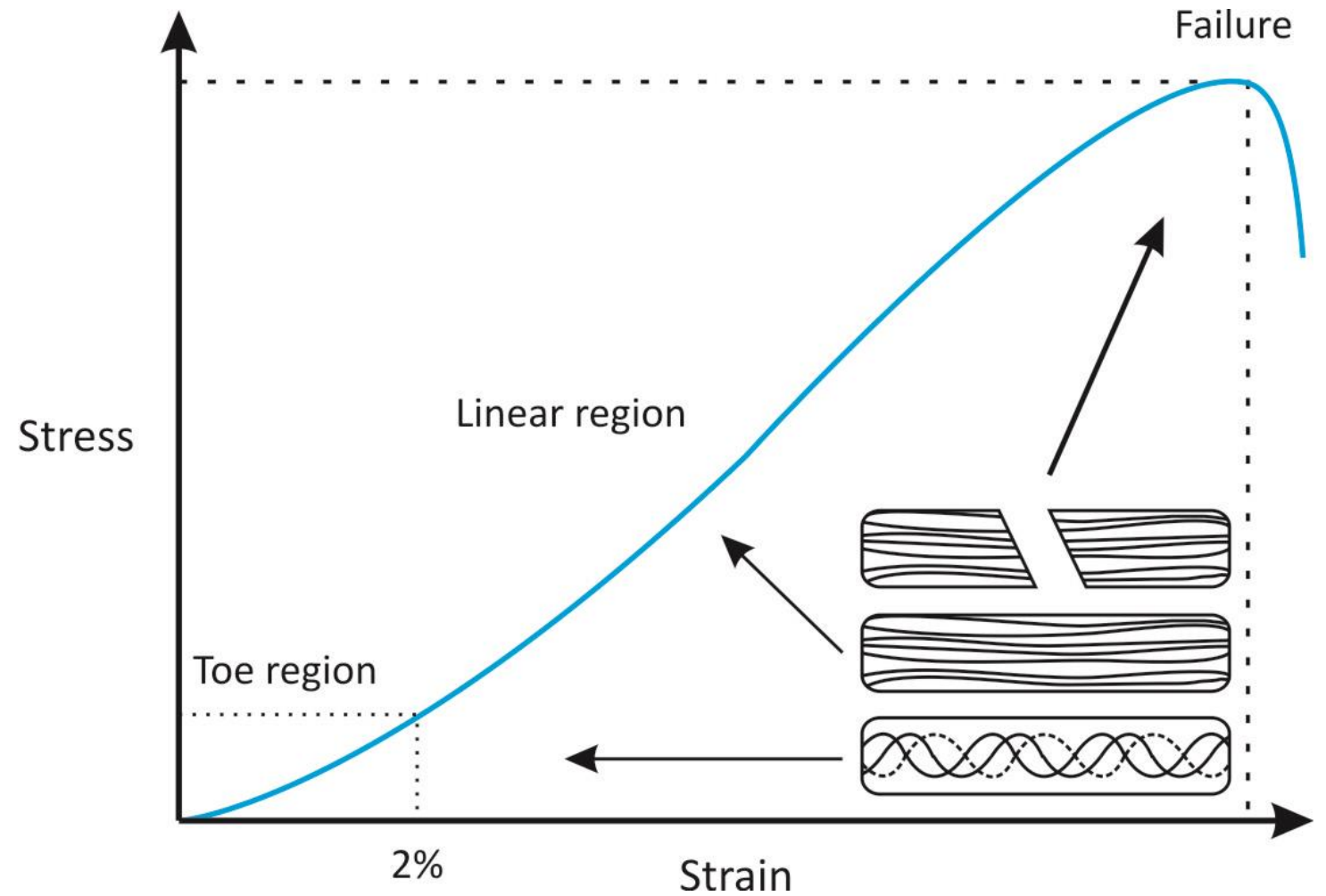
# Range of movement

- Becomes the primary muscle when knee is bent at 90 degrees (Lauber et al, 2014)
- Mild soleus involvement when knee is at 0 degrees (Kovacs, 2024)



# Stress-strain curve

- Elastic Region – 0-8% strain, 0-150 N (Noelle et al, 2022)
- Plastic Region – 8-12% strain, 150-300N (Miller et al, 2008)
- Failure Point – 12% + strain, 300+N (Tang et al, 2014)



(Kuhta et al, 2013)

# Types of injury

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- Grade I: mild strain
- Grade II: partial tear
- Grade III: complete rupture

## Soleus



# Stages of healing

- Inflammation (0–72 hrs)
  - Proliferation (3–21 days)
  - Remodeling (3–6 weeks+)
- (Laumonier et al, 2016)



# Healing timeframes

- Mild strain: 2–3 weeks
  - Moderate strain: 4–6 weeks
  - Full rupture: 8–12 weeks+
- (Jarvinen et al, 2005)

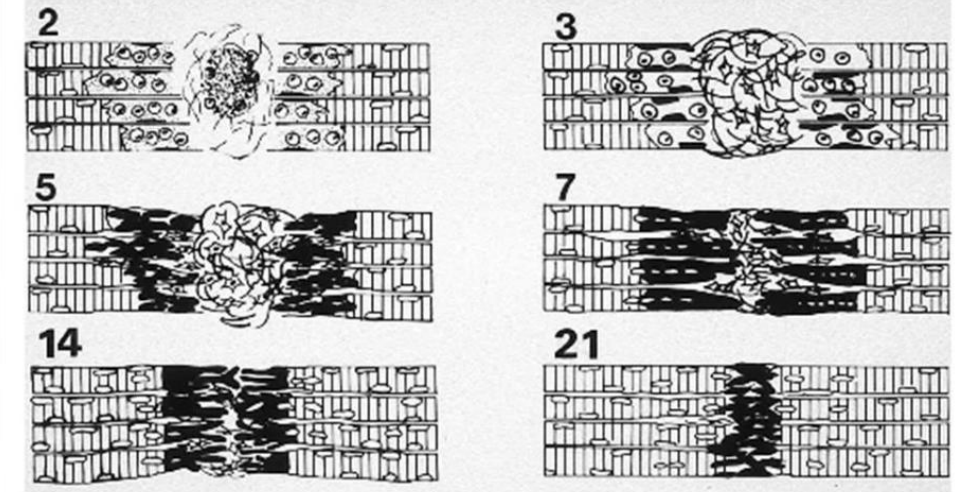


**Figure 2.** A schematic illustration of the healing skeletal muscle. Day 2: the necrotized parts of the transected myofibers are being removed by macrophages while, concomitantly, the formation of the connective tissue scar by fibroblasts has begun in the central zone (CZ). Day 3: satellite cells have become activated within the basal lamina cylinders in the regeneration zone (RZ). Day 5: myoblasts have fused into myotubes in the RZ, and the connective tissue in the CZ has become denser. Day 7: the regenerating muscle cells extend out of the old basal lamina cylinders into the CZ and begin to pierce through the scar. Day 14: the scar of the CZ has further condensed and reduced in size, and the regenerating myofibers close the CZ gap. Day 21: the interlacing myofibers are virtually fused with little intervening connective tissue (scar) in between.

# Rehab Stages - Isometric

- Between 2-4 weeks post injury
- Restore muscle activation
- Promote muscle healing without strain

(Jarvinan et al,2005)

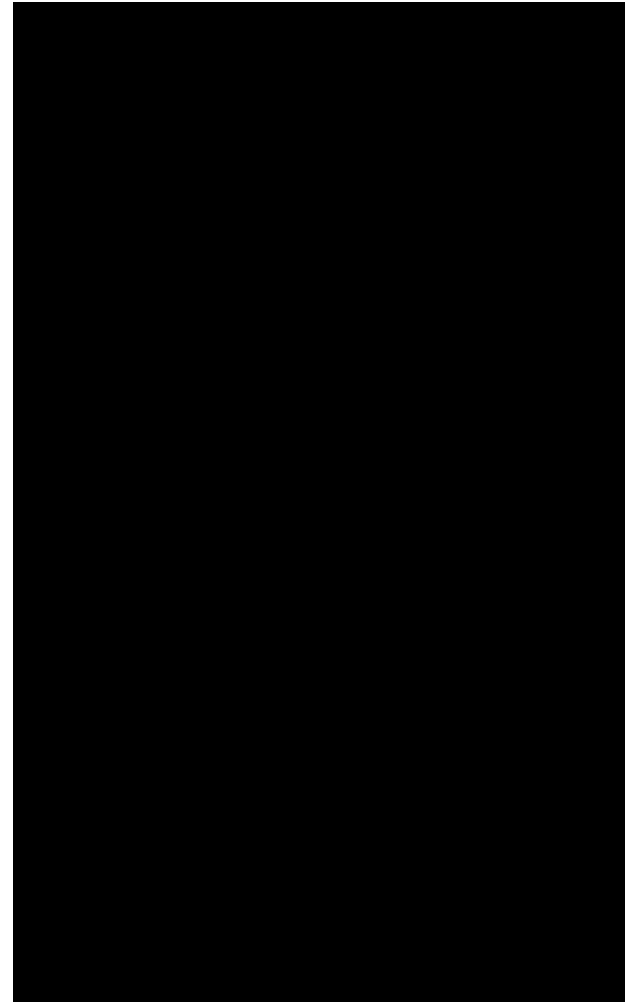


# Isometric knee to wall

(O'Neill et al, 2019)

Progression – Increase dorsiflexion

Regression – Reduce dorsiflexion

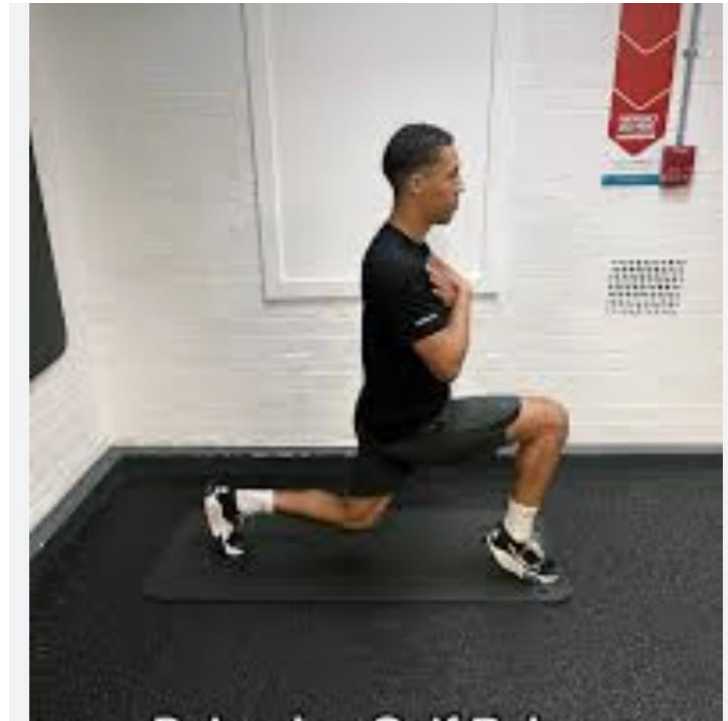


# Isometric Calf hold in half kneeling

(Rio et al, 2015)

Progression – Add external force  
(Dumbbell or weightplate)

Regression – Reduce bodyweight force by  
shifting backwards



## Rehab stages - Concentric

- Between 4-8 weeks post injury
- Improve range of movement
- Begin rebuilding strength

(Jarvinan et al, 2005)



# Concentric Calf raise – knees bent

- Progression – Single leg
- Regression – Minimise the elevation

(Silbernagel et al, 2006)



# Concentric Calf raise in half kneeling – onto elevation

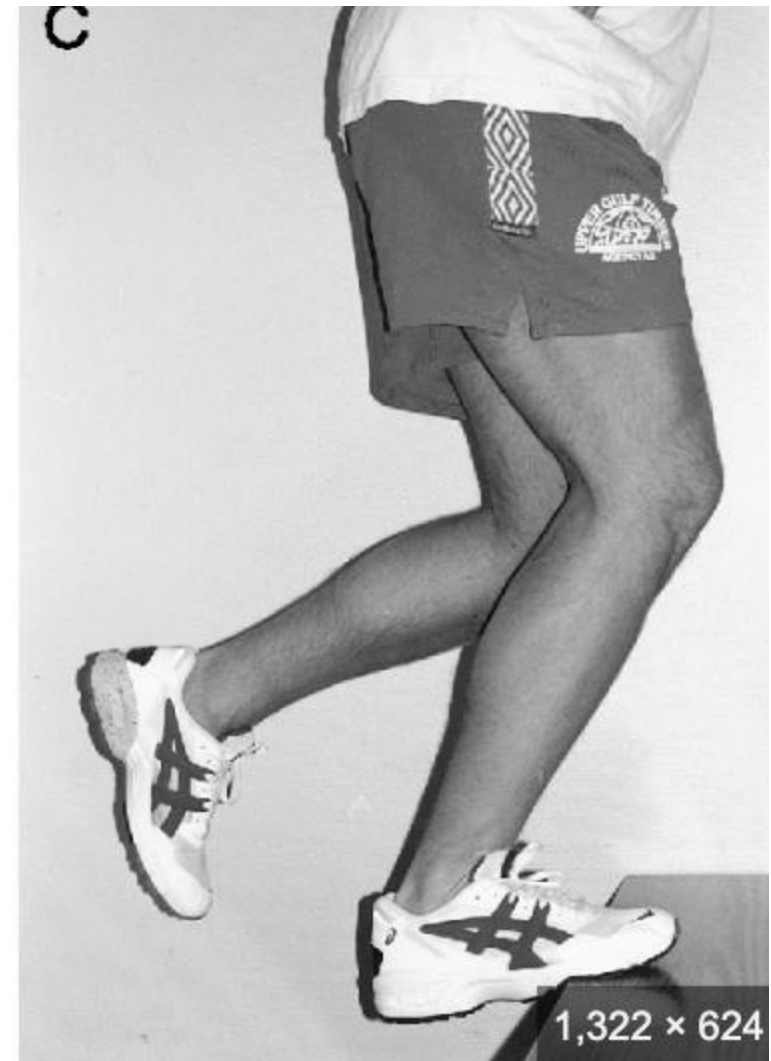
- Progression – Add larger deficit
- Regression – Use hands for support

(Herbert-Loiser et al, 2017)



# Rehab stages - Eccentric

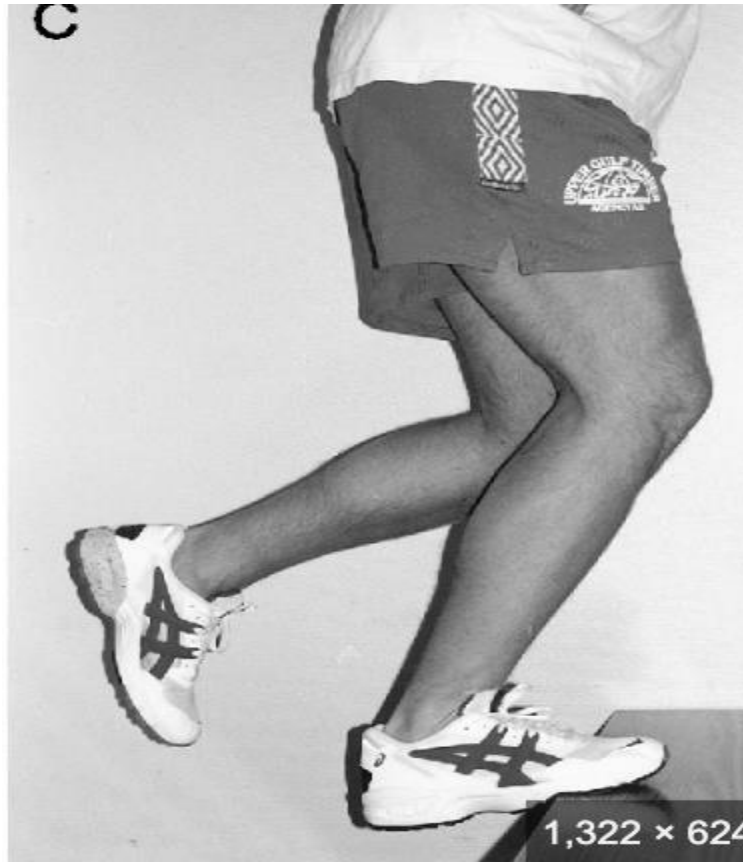
- Between 8-12 weeks post injury
- Improve force absorption capacity
- Align collagen fibres for functional resilience (Jarvinan et al, 2005)



# Eccentric Heel drops

- Progression – single leg
- Regression – Perform on flat surface

(Alfredson et al, 1998)



# Rehab stages - Plyometric

(Jarvinan et al, 2005)

- 12 weeks – 6 months post injury
- Restore explosive force
- Prepare for sport specific demands

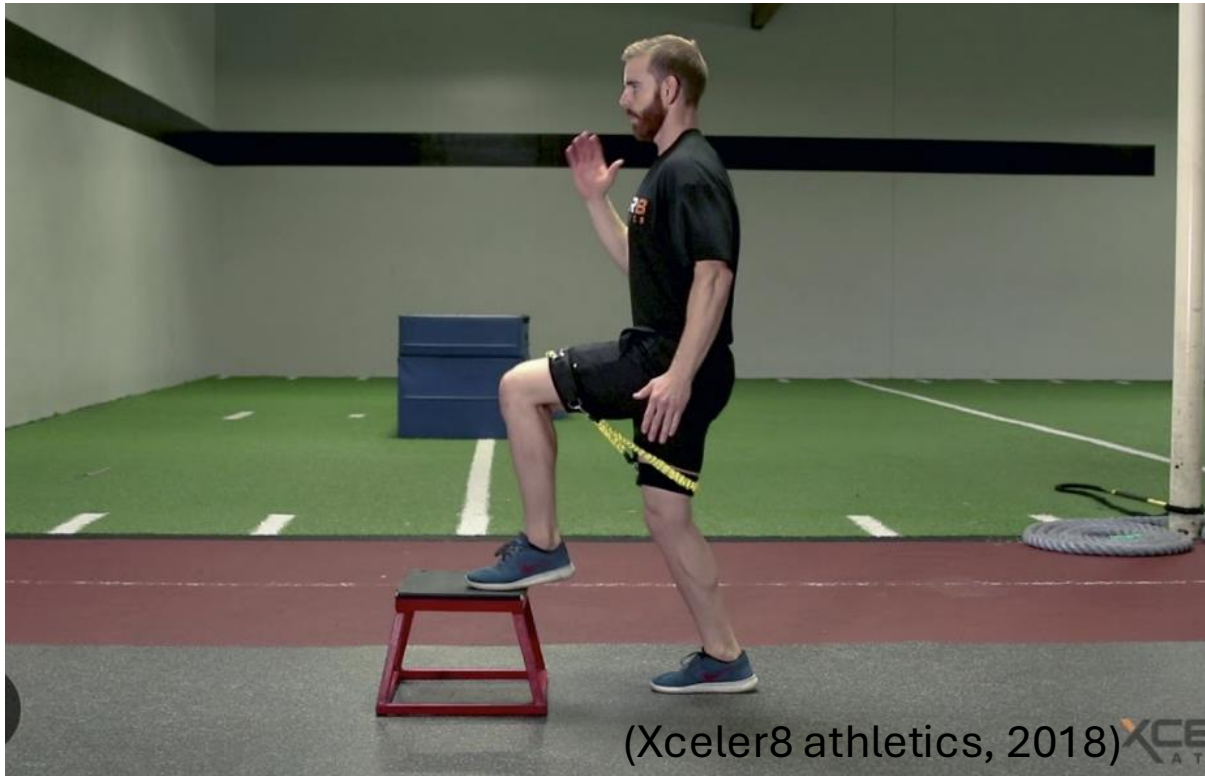


1,920 × 1,080

# Toe taps

(Silbernagel et al, 2006)

- Progression – Faster
- Regression – Lower elevation



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