ACTIVFORCE | webinar

GLUTEUS MEDIUS TEAR

Introductions

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Introductions

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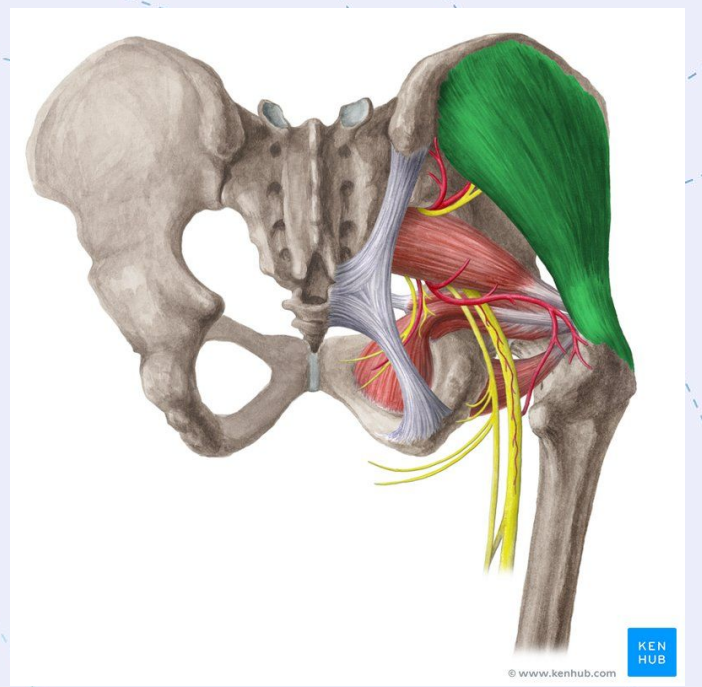
Agenda

- Introduction to Gluteus Medius Tear
- Clinical presentations, common causes, risk factors, anatomical structures involved
- PT Assessment: Range of Motion for hip abduction, hip external rotation, and pelvic tilt assessment
- PT Assessment: Muscle Testing for Gluteus Medius, Trendelenburg Test, Functional Movement Screening (Single-leg stance, Gait Analysis)
- Case Study: Patient profile, etc.
- Treatment and Rehabilitation Strategies: Acute Pain Management, Strengthening and Neuromuscular Re-education, and Functional Movement Training
- Q&A

Gluteus Medius Tear

Gluteus Medius Tear

- It is a partial or complete rupture of the gluteus medius muscle, often occurring at its tendinous attachment to the greater trochanter of the femur, causing pain, weakness, and potential limping.
- Pain is usually on the outside area of the hip.

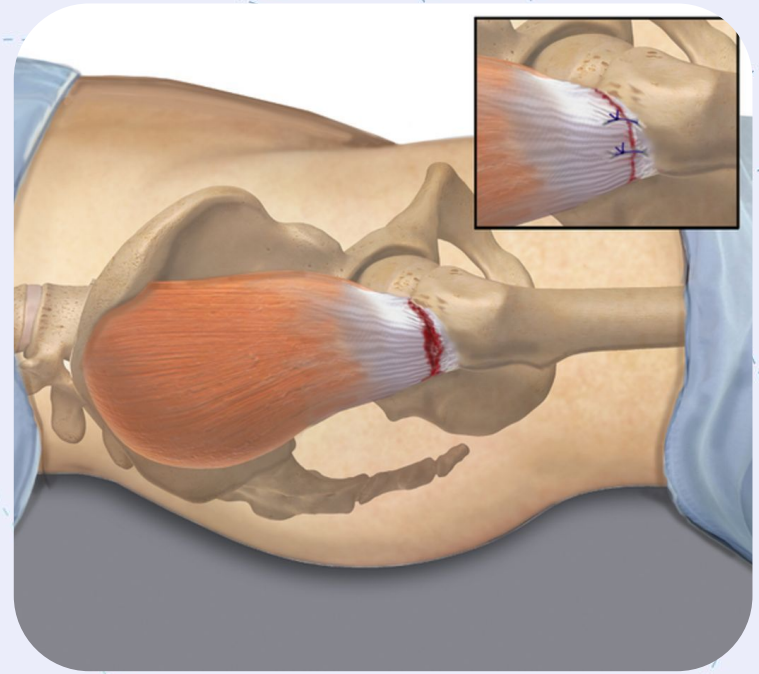


Clinical Presentation

- Pain on the buttocks, groin, or outside area of the hip, which may worsen with activities:
  - Running
  - climbing stairs
  - lying on the affected side
- Weakness of hip abduction and hip external rotation
- Limping
- (+) Trendelenburg Sign - one hip drops when standing on one leg

Common Causes

- Overuse and Repetitive Activities
  - Running, cycling, or dancing
  - Sudden bursts of activity
  - Poor exercise warm-up
- Trauma and Injury
  - Falls
  - Direct impact
- Degenerative Conditions and Aging
  - Osteoarthritis of the hip
  - Tendinopathy
  - Aging



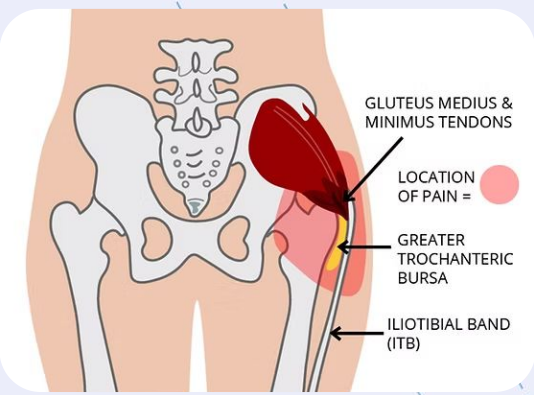
Risk Factors for Gluteus Medius Tear

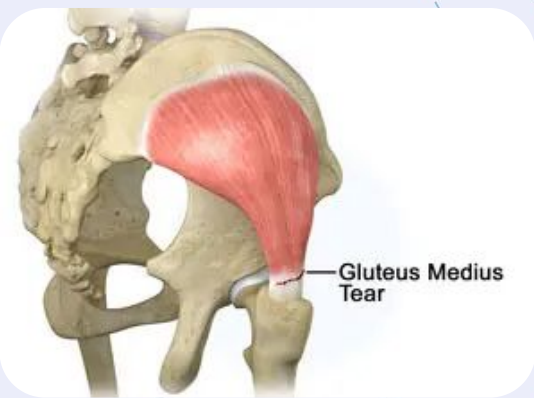
Demographics

- More likely in women compared to men.
  - Due to pelvic biomechanics, different activity levels, and hormonal factors
- More common in ages between 40s to 60s

Structures Affected

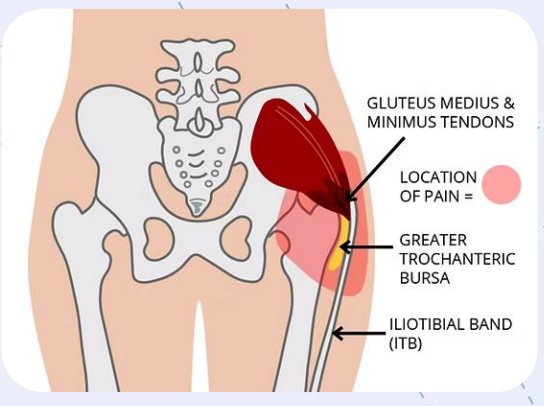
- Gluteus Medius Muscle
  - stabilizes the pelvis and abduct the hip
- Gluteus Medius Tendon
  - connects the muscle to the bone
- Greater Trochanter
  - bony prominence where the tendon attaches





Other Structures Affected

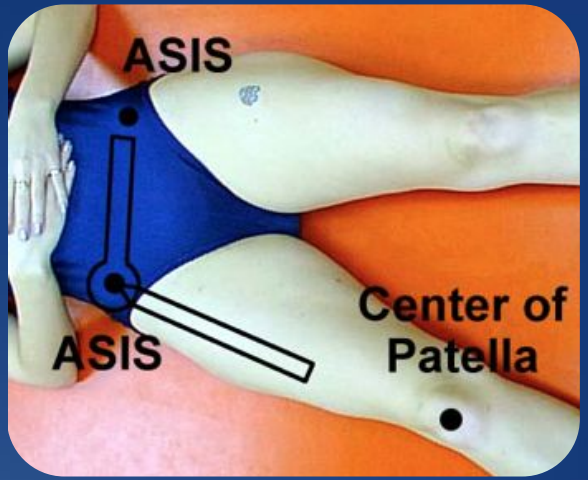
- Gluteus Minimus
- Tendinopathy
  - Chronic inflammation of the gluteus medius tendon can lead to tears.
- Bursitis
  - Inflammation of the bursa (fluid-filled sac) near the greater trochanter can occur with gluteus medius tears.
- Greater Trochanteric Pain Syndrome
  - Chronic lateral hip pain, which can be caused by tears of the gluteus medius and minimus.
- Neurovascular Structures
  - In some cases, hip fractures, dislocations, or surgeries can damage the gluteus medius and its supplying artery and nerve.



Clinical Assessment

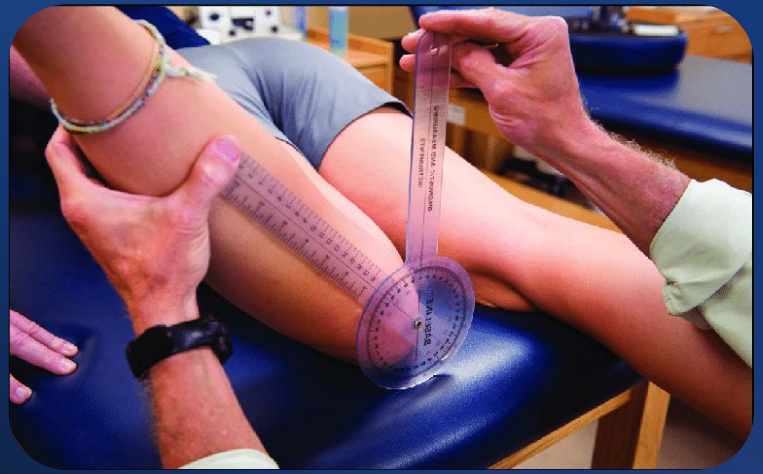
Range of Motion: HIP ABDUCTION

- Can be tested in Supine position



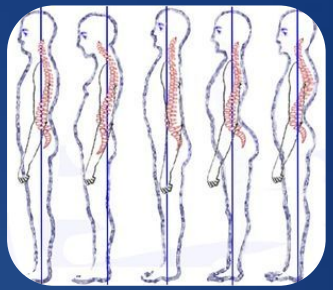
Range of Motion:
HIP INTERNAL ROTATION

- Can be tested in Sitting and Prone positions



Range of Motion:
PELVIC TILT ASSESSMENT

- Evaluating the position of the pelvis in relation to a horizontal line
- Often through visual inspection, palpation, or inclinometers
  - **Anterior Pelvic Tilt**:
    - The front of the pelvis (anterior superior iliac spines - ASIS) tilts downward relative to the back of the pelvis (posterior superior iliac spines - PSIS).
  - **Posterior Pelvic Tilt**:
    - The front of the pelvis tilts upward relative to the back of the pelvis.

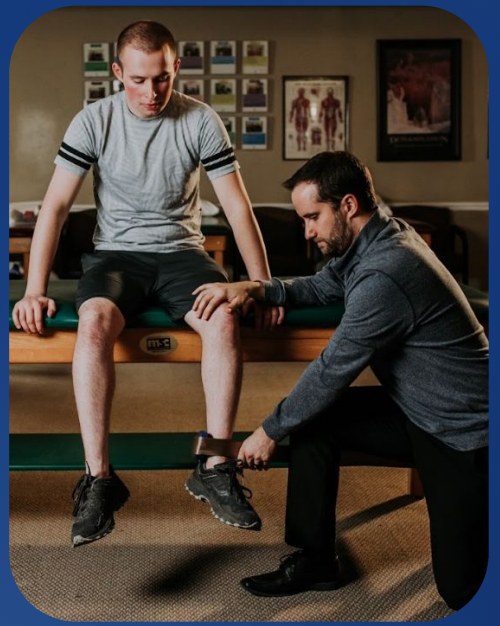


Muscle Testing: HIP ABDUCTORS

- Can test in Supine and SideLying
- Can be tested with or without a strap
- Can be tested at knee or ankle

Muscle Testing:
HIP EXTERNAL ROTATORS

- Can test in Sitting and Prone
- Usually done with a strap
- Tested at Ankle



Underestimating Strength with HHD

- When testing strength using HHD, an external fixation should be used when testing forces >200 N (~45lbs.) to avoid underestimating strength [1]
- Tester strength is an issue when using HDD when the patient's strength exceeds 120 N (~27lbs.) for a given muscle [2]
- Inter-rater Reliability using a belt fixation was found to have ICC values of .76 - .95 [3]
    - More closely approaches an equal value to intra-rater reliability values

[1] Thornborg K, Bandholm T, Holmich P. Hip and Knee Strength Assessments using a Handheld Dynamometer with External Belt Fixation are Inter-tester Reliable. Knee Surg Sports Traumatol Arthrosc. 2013; 21:550-555
[2] Wikholm JB, Bohannon RW. Handheld Dynamometry measurements: tester strength makes a difference. J Ortho Sports Phys Ther. 1991; 12:191-198
[3] Thornborg K, Bandholm T, Holmich P. Hip and Knee Strength Assessments using a Handheld Dynamometer with External Belt Fixation are Inter-tester Reliable. Knee Surg Sports Traumatol Arthrosc. 2013; 21:550-555

Why you need a belt?

24 y/o
Female Soccer Player:

- What would the MMT score have show?

Average Values	
Left	83.95 lb
Right	70.44 lb
Peak Force (lb)	
Left	101.34 lb
Right	85.20 lb
Strength Difference	**16.14 lb**
Percentage Difference	**17.31%**
Force to Weight Ratio	
Weight	147 lb
Left	68.94%
Right	57.96%
F/W Difference	**10.98%**

What information is obtained from a dynamometer?

Peak Force (lb)	
Left	62.77 lb
Right	66.45 lb
Strength Difference	3.68 lb
Percentage Difference	5.69%

- Good symmetry side to side, how do you feel about this patient?

What other clinical information is obtained?

Force to Weight Ratio

Weight	200 lb
Left	31.39%
Right	33.22%
F/W Difference	1.84%

- With the same patient, how do you feel about them now?

Normative Values for 40-49 y/o's

Motion/Muscle	Sex	Pound-Force (average)	Force/body weight (%)	Position
Shoulder Abduction	Male Female	55 lbs. 31 lbs.	29% 22%	Supine. Shoulder abducted 45 degrees; elbow extended
Shoulder ER	Male Female	42 lbs. 25 lbs.	22% 19%	Supine. Shoulder abducted 45 degrees; elbow at 90 degrees
Elbow Flexion	Male Female	60 lbs. 34 lbs.	33% 25%	Supine. Shoulder neutral, elbow at 90 degrees, forearm supinated
Knee Extension	Male Female	131 lbs.** 85 lbs.	70% 62%	Sitting. Hips and knees flexed to 90 degrees
Hip Abduction	Male Female	70 lbs. 49 lbs.	37% 36%	Supine. Hips neutral, knees extended
*Shoulder Flexion (Age 50-59)	Male Female	60 lbs. 36 lbs.	32% 24%	Supine. Shoulder flexed to 90 degrees, elbow extended
*Shoulder IR (Age 50-59)	Male Female	43 lbs. 22 lbs.	23% 15%	Supine. Shoulder abducted 45 degrees; elbow at 90 degrees

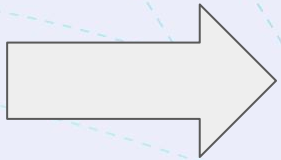
Values are from: Bohannon, R. Reference values for extremity muscle strength obtained by handheld dynamometry from adults aged 20-79 years

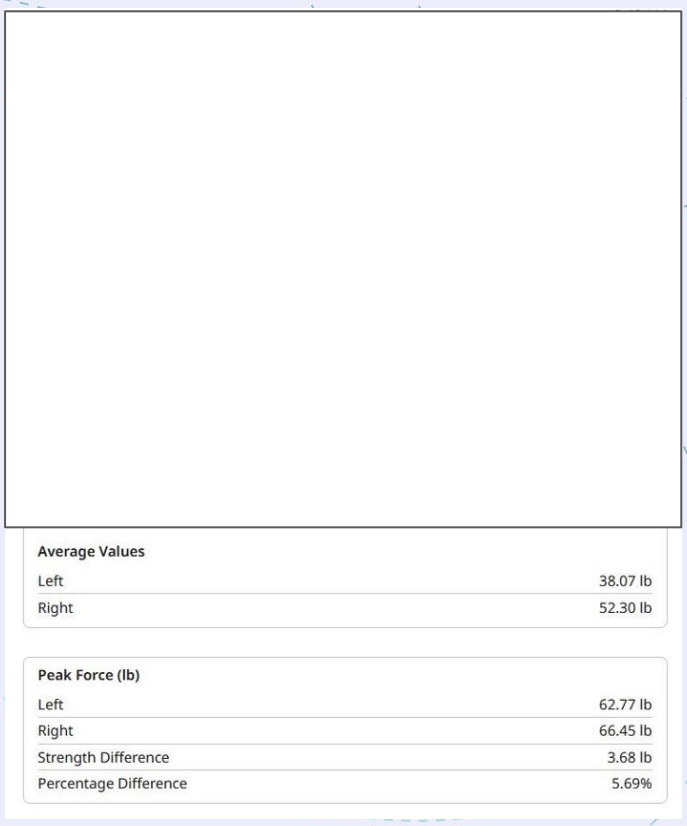
The “picture” tells so much more

Poor recruitment of Gluteus Medius with delayed RFP on the left side

- Knowing this, would you change their exercise program?

Do you think this would have been found using 0-5 MMT?





Average Values	
Left	38.07 lb
Right	52.30 lb

Peak Force (lb)	
Left	62.77 lb
Right	66.45 lb
Strength Difference	3.68 lb
Percentage Difference	5.69%

What is rate of Force Development (RFD)?

Maximal voluntary contraction (MVC) measures the peak force a muscle can achieve.

Rate of force development (RFD) refers to the speed at which a muscle generates force during contraction.

RFD is a vital indicator of neuromuscular performance, encompassing both the mechanical capacity of the muscle to generate force and the neural processes necessary for the muscle contraction.

Could this be used in fall prevention?

Neuromuscular rate of force development discriminates fallers in ambulatory persons with multiple sclerosis - an exploratory study

Nick M Kristensen [a,1], Laurits Taul-Madsen [a,1], Tobias Gaemelke [a], Morten Riemenschneider [a,b], Ulrik Dalgas [a], Lars G Hvid [a,b,*]

[a] *Exercise Biology, Department of Public Health, Aarhus University, Denmark*
[b] *The Danish MS Hospitals, Ry and Haslev, Denmark*

Conclusion: In this exploratory study, knee extensor neuromuscular function was able to discriminate fallers from non-fallers in pwMS, with RFD being superior to Fmax. Routine assessment of lower extremity neuromuscular function (RFD_{50ms} in particular) may be a helpful tool in identifying pwMS at future risk of falling.

2023

Could this be used in fall prevention?

Review Article

The importance of neuromuscular rate of force development for physical function in aging and common neurodegenerative disorders – a systematic review

Sidsel D. Lomborg[1], Ulrik Dalgas[1], Lars G. Hvid[1,2]

[1]Exercise Biology, Department of Public Health, Aarhus University, Denmark;
[2]The Danish MS Hospitals, Ry and Haslev, Denmark

Lower extremity RFD is (1) particularly sensitive (i.e. adapts earlier and/or more extensively) towards neurodegeneration, and more so than Fmax, and (2) of importance for physical function but apparently not superior to Fmax. RFD could serve as a useful indicator/biomarker of changes in neuromuscular function elicited by neurodegeneration.

2022

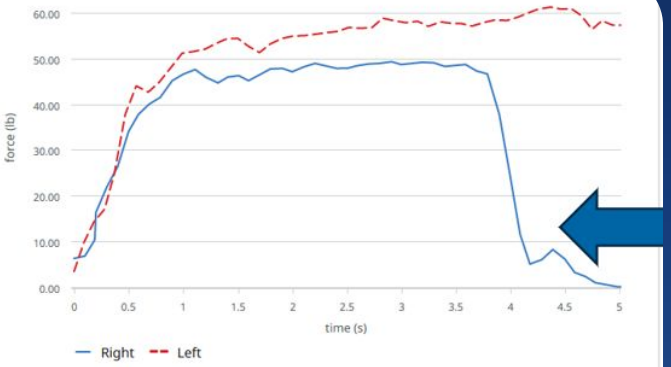
Initial eval of an 82 y/o male with recent history of falls performed on 7/25/2024

- PMH:
- Right hip arthroplasty performed on Feb. 15, 2024. This was complicated as patient fell at home Feb. 17, 2024, while going to bathroom. He fell backward into shower.
- Patient has a long history of lower back pain and has underwent surgical fusion S1 through T10, C3-T4, he has a pain pump that he states has helped a great deal with his lower back pain.
- He states that he has lost a lot of strength of his lower extremities, and he struggles to stand from a sitting position, ascend stairs and walk very far.

Initial eval of an 82 y/o male with recent history of falls performed on 7/25/2024

- On attempt to rise from a seated position, patient's hips moved into adduction (knees towards each other) and he struggled using arm rest to stand.
- Gait: short step lengths, poor foot clearance due to limited hip and knee flexion.

Hip Abduction Sidelying, remember Normative Values for this motion in 56 lbs

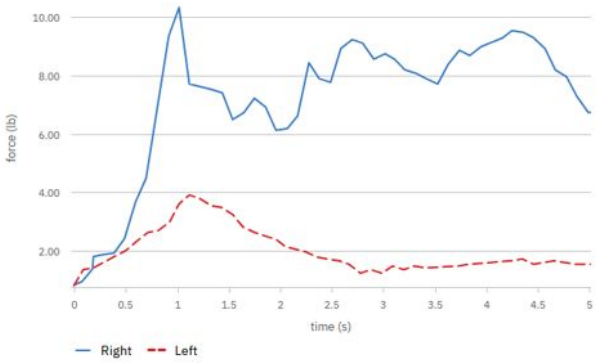


Affected side, right

Average Values	
Right	34.94 lb
Left	52.29 lb

Peak Force (lb)	
Right	49.29 lb
Left	61.26 lb
Strength Difference	11.97 lb
Percentage Difference	21.65%

Example of poor muscle recruitment, with delays RFP and unable to maintain force



Average Values	
Right	7.33 lb
Left	2.02 lb

Peak Force (lb)	
Right	10.35 lb
Left	3.91 lb
Strength Difference	6.43 lb
Percentage Difference	90.23%

Gluteus Medius tear on Left Side

Handheld Dynamometry vs Manual Muscle Testing

HHD

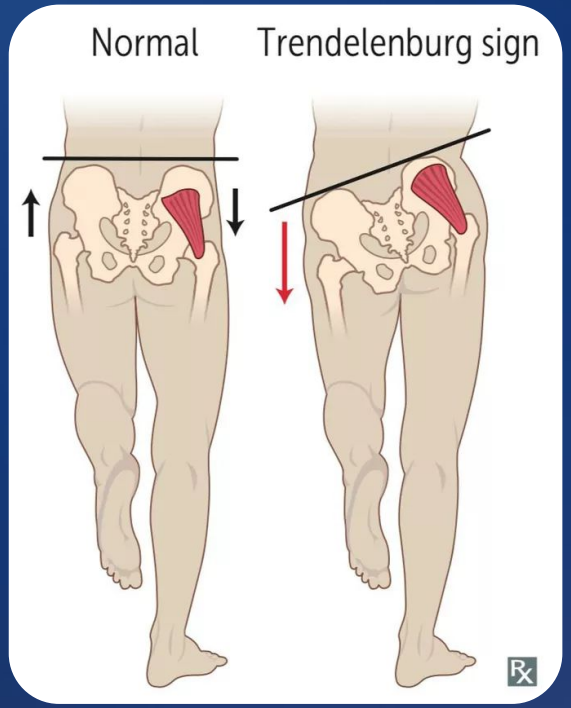
- Peak force with direct comparison to opposite side.
- Average force across the length of the contraction, useful to note fatigue.
- Force time curve that shows clinician RFD.
- Data can help clinician determine therapeutic exercises to use for patient (slow to develop base strength or rapid activities for rate for recruitment).
- Can use to compare to peers by looking at the force to bodyweight ratios.

MMT

- Estimation of force “felt” by clinician and judgement made on side-to-side difference

Functional Movement Screening: Trendelenburg Gait

- Assesses hip stability and the strength of the hip abductor muscles by observing for a drop in the pelvis on the non-weight bearing side during single-leg stance
- A positive test suggests weakness of the hip abductor muscles, potentially leading to a Trendelenburg gait (a limp where the pelvis drops on the non-weight-bearing side).



Functional Movement Screening: Gait Analysis

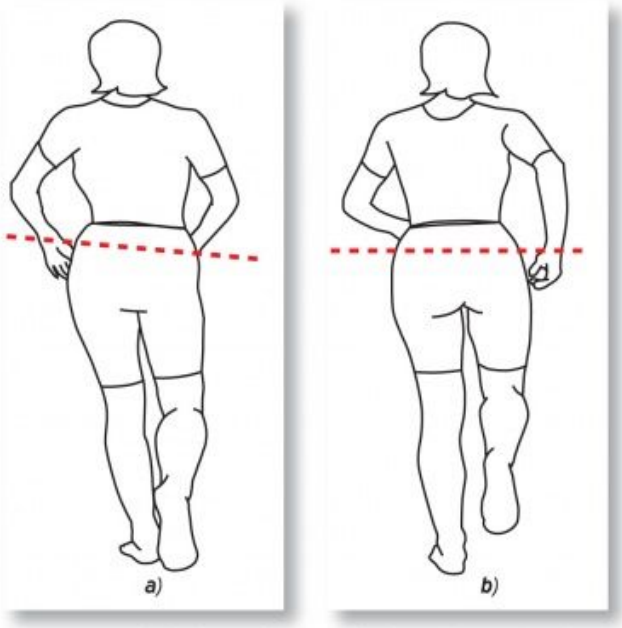


Figure 6a: Trendelenburg gait – inadequate pelvic stability;

Left Figure 6b: normal gait – adequate pelvic stability

- Can be observed during Midstance

Treatment and rehabilitation Strategies

Treatment & Rehabilitation Strategies

- Acute Phase Management
- Strengthening & Neuromuscular Re-Education
- Functional Movement Training

Activation of Gluteus Medius

Level of Gluteus medius activation	Types of exercises
Moderate-level activation (21–40% MVIC)	1. Prone bridge plank (27% ± 11% MVIC) 2. Bridging on stable surface (28% ± 17% MVIC) 3. Lunge-neutral trunk position (34% MVIC) 4. Unilateral mini-squat (36% ± 17% MVIC) 5. Retro step-up (37% ± 18% MVIC) 6. Clam with 60° hip flexion (38% ± 29% MVIC) 7. Sideways lunge (39% ± 19& MVIC) 8. Clam with 30° hip flexion (40% ± 38% MVIC)
High-level activation (41–60% MVIC)	1. Lateral step-up (41% MVIC) 2. Quadruped with contralateral arm and leg lift (42% ± 17% MVIC) 3. Forward step-up (44% ± 17% MVIC) 4. Unilateral bridge (47% ± 24% MVIC) 5. Transverse lunge (48% ± 21% MVIC) 6. Wall squat (52% ± 22% MVIC) 7. Side-lying hip abduction (56% MVIC) 8. Pelvic drop (57% ± 32% MVIC) 9. Single-limb deadlift (58% ± 22% MVIC)
Very high-level activation (>60% MVIC)	1. Single-limb squat (64% ± 24% MVIC) 2. Side-bridge to neutral spine position (74% ± 30% MVIC).

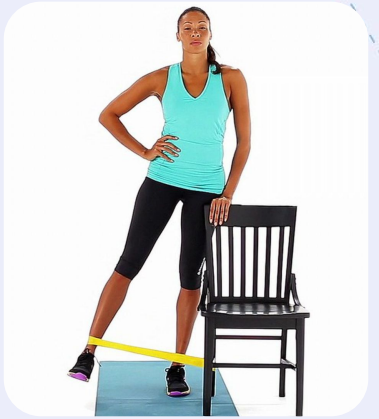
- Each exercise activates the Gluteus Medius by a certain percentage as shown by EMG activity.
- MVIC = maximum voluntary isometric contraction.
  The prone bridge/plank are unique from the other exercises because of it's static nature

Acute Phase Management

- Pain Control
  - Cryotherapy
  - Manual Therapy
- Activity Modification
  - Avoid excessive hip loading
- Isometric Exercises
  - To maintain muscle activation

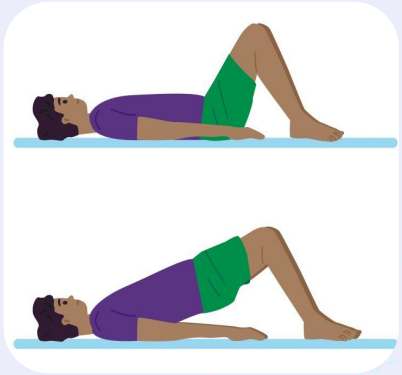
Strengthening & Neuromuscular Re-education

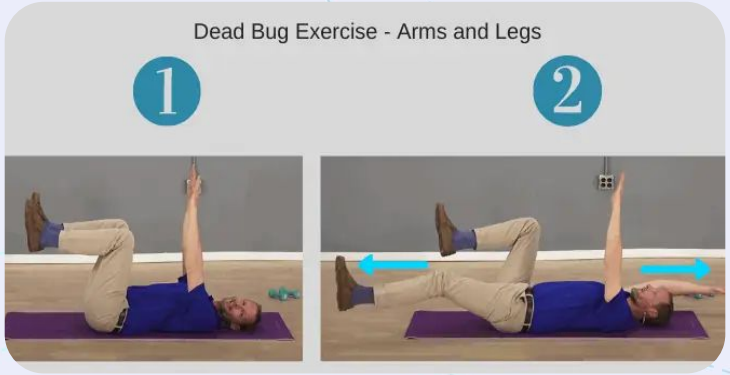
- Gluteus Medius activation exercises
  - Clamshells
  - Sidelying hip abduction
  - Standing hip abduction



Strengthening & Neuromuscular Re-education

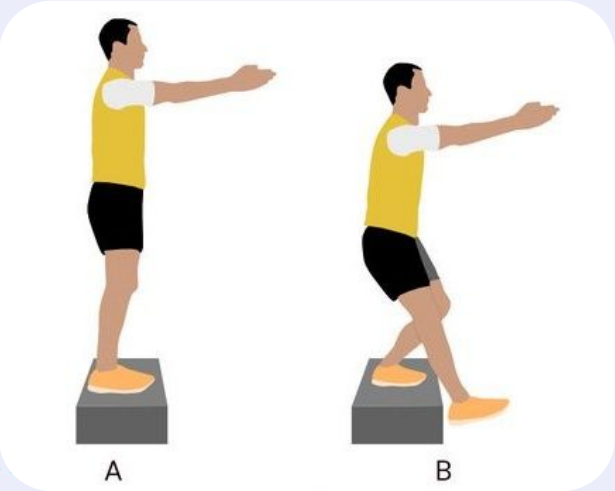
- Core and Pelvic Stability Training
  - Bridges
  - Dead bugs
  - Side planks





Strengthening & Neuromuscular Re-education

- Eccentric Strengthening
  - Controlled Single-leg Squats
  - Step down exercises



Functional Movement Training

- Gait Retraining
  - Correct compensatory patterns
- Sport-Specific Drills
  - For return to activity
- Dynamic Stabilization
  - Single-leg drills, resisted side-stepping

“If you keep doing the same thing then you will always get the same results.”

— Dave Ramsey

Questions?

@ActivForce @activforce @ActivForce @ActivBody inc