

TAKE DOWN THE WALL BREAKING BARRIERS IN TENDON REHABILITATION

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Sports Medicine Symposium
Central Connecticut State University
New Britain, CT

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There exists no conflict of interest or financial relationship between the CT Athletic Trainers Association, Central Connecticut State University and this speaker

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HISTORY

- **52 year-old female**
- Started therapy on **10-18-15**
- Began experiencing increased (R) foot pain in **April, 2015** with no apparent accident injury.
- Attempted to live with the pain, modifying her sporting activity, but the pain persisted.

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HISTORY

- **Symptoms:**
 - Pain is worse when she **first arises** from bed and attempts to put weight on the foot to the point where she has to wait to see if the leg will hold her as the pain radiates up to the ankle.
- She her MD on **9-24-15**. **Dx: foot/ankle pain**
- No tests were run.
- Physical Therapy was ordered.

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HISTORY

- She recently purchased an **orthotic** which she is gradually increasing her wearing time in and feels this may be helping.
- She has **intermittent tingling** in the ball of the foot but cannot define a pattern to this. She states this has not been as evident recently.

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PAST MEDICAL HISTORY

- Lower Extremity Injuries:**
- **1985/1995: ACL reconstruction**
 - No prior hx/o of foot/ankle injuries other than **ankle sprains** playing basketball in HS and college
 - **Intermittent hip pain** in the last few months since her foot has been bothering her

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PAST MEDICAL HISTORY

• **Low Back Pain:**

–No hx/o of lumbar pain or injury, but has had intermittent lumbar pain since her foot has been bothering her

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PAST MEDICAL HISTORY

• **Upper Extremity Injuries:**

–**2008:** ® rotator cuff repair
–**2009:** (L) rotator cuff repair
–No other history of upper extremity injuries

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PAST MEDICAL HISTORY

• **Cervical Pain:**

–**2008:** MVA: she was stopped at a red light and hit from behind. Had a whiplash injury, but did not undergo formal treatment because she had impending rotator cuff surgery

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PAST MEDICAL HISTORY

- **Surgeries:**
 - None other than those listed previously
- **Fractures:**
 - Nose
- **Medical:**
 - She denies any other medical problems.
 - Non-smoker.

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EXAMINATION

- **Pain: ® lower leg/foot pain:**
 - Rated a **“9-10”/10** in the **AM**
 - **“3-4”/10** at present.

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EXAMINATION

Worse:

- Initial standing when getting out of bed in the AM.
- Standing > 2 hours.
- Sit to Stand transfers: some times.
- When rising after a period of sitting.
- Has modified her workout routine.

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EXAMINATION

Better:

- Taping.
- Movement/walking in sneakers (not shoes).

Time of Day:

- Worse in the AM or any time she rises after sitting.

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EXAMINATION

Postural Dysfunction

- Elevated @ iliac crest.
- Elevated @ Shoulder/scapula
- Stands with the @ knee in slight flexion
- Minimally dropped navicular/medial arch decline

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EXAMINATION

Thoracolumbar mobility

- Flexion: 0" to the floor: pain free- tight hamstrings; (+) jump @
- Extension: 15°: deep @ sulcus
- Rotation @: 40%: pain free
- Rotation (L): 30%: pain free
- Side bending @: knee crease: pain free
- Side bending (L): knee crease: pain free

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EXAMINATION

Strength: 5/5 and pain free in (B) LE's except:

- @ LE deficits
 - **Plantarflexion:** 3/5 with medial ankle pain on 1st rep
 - **Dorsiflexion:** 4/5
 - **Eversion:** 4/5 with "unstable" feeling
 - **Knee extension:** 4-/5 "unstable"
 - **Gluteals:** poor timing/firing patterns (B)

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EXAMINATION

• **Soft Tissue:**

- **moderate/severe tenderness** with palpation of the (R) posterior tibial tendon and the @ plantar fascia.
- **Severe atrophy** of the @ VMO.
- **Moderate spasm** @ thoracic paravertebral mm and @ upper trap

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TIBIALIS POSTERIOR

Origin:

- inner posterior borders of the tibia and fibula
- Interosseous membrane
- Descends posterior to the medial malleolus and divides into the
 - Plantar
 - Main and
 - Recurrent components

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TIBIALIS POSTERIOR

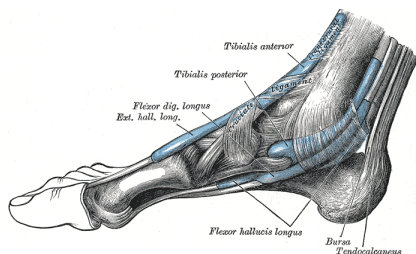
Insertion:

- Plantar portion:
 - Bases of the 2nd, 3rd and 4th metatarsals
 - 2nd and 3rd cuneiforms
 - cuboid
- Main portion:
 - Tuberosity of the navicular
 - Plantar surface of the 1st cuneiform
- Recurrent Portion:
 - Sustentaculum tali
 - calcaneus

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ANATOMY



• By Henry Vandyke Carter - Henry Gray (1918) Anatomy of the Human Body (See "Book" section below)Bartleby.com: Gray's Anatomy, Plate 442, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=561497>

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TIBIALIS POSTERIOR

Nerve:

- Tibial nerve: L4-5: medial heel

Artery:

- Posterior Tibial artery

Referral Pattern:

- posterior leg, Achilles tendon, heel and sole of foot

Reference: McGee: "Orthopedic Physical Assessment" 5th edition

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TIBIALIS POSTERIOR

FUNCTION:

- **Inversion** of the foot
- **Plantarflexion** of the foot at the ankle
- Major role in **supporting the medial longitudinal arch** of the foot and is therefore plays a key role in stabilization
- Weakness or rupture can lead to **flat foot** as well as a **valgus deformity**

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POSTERIOR TIBIAL TENDON INSUFFICIENCY

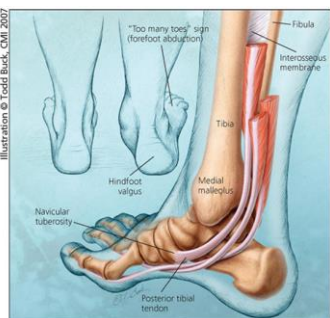


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TIBIALIS POSTERIOR

STAGES OF DYSFUNCTION:

- Initially: pain over the tendon in the inner part of the hind foot and mid foot
- As the deformity progresses, it can threaten the persons ability to walk
- Just as the tendon loses it's ability to support the arch, the ligaments then also can become stretched out and fail- causing a major deformity

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TIBIALIS POSTERIOR

STAGES OF DYSFUNCTION

Stage 1:

– pain along the posterior tibial tendon without deformity or collapse of the arch. The patient has the somewhat flat or normal-appearing foot they have always had.

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TIBIALIS POSTERIOR

STAGES OF DYSFUNCTION

Stage 2:

- Deformity from the condition has started to occur, resulting in some collapse of the arch
- This may or may not be noticeable.
- Patient may feel it as a weakness in the arch.
- Many patients initially present in this stage II

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TIBIALIS POSTERIOR

STAGES OF DYSFUNCTION

Stage 3:

– The deformity has progressed to the extent where the foot becomes fixed (rigid) in its deformed position.

Stage 4:

– Deformity occurs in both the ankle and the foot

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TIBIALIS POSTERIOR

CAUSE:

- Uncertain
- Usually **NOT** associated with trauma
- More a gradual degeneration of the soft tissues supporting the inside of the foot
- Most often associated with a pronated foot

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EXAMINATION

Sensation:

- intact to light touch in (B) LE's.
- Reports (L) LE is "tingly" to light touch: dorsum of foot.

Reflexes:

- 2+ in (B) Knee Jerk and Ankle Jerk.

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EXAMINATION

Special Tests:

- **LEFS:** 62/80 = 22.5% disability
- **Single Limb Balance**
 - 30 seconds (B) eyes open but less stable on the ®

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EXAMINATION

- **Patla Tibialis Posterior Length Test:**
 - **Patient is prone:** knee flexed **90 degrees**
 - One hand: holds the **Calcaneus** in **eversion** and **ankle** in **dorsiflexion**
 - Other hand: examiner's thumb contacts the plantar surface of the **bases of the 2nd, 3rd, and 4th metatarsals** while the index finger contacts the plantar surface of the **navicular**

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EXAMINATION

- **Patla Tibialis Posterior Length Test:**
 - The examiner then **determines the end feel** by **pushing dorsally** on the **navicular and metatarsal heads**.
 - The end feel is compared with the normal side.
 - A reproduction of the patient's symptoms indicates a positive test
 - **Pg. 895 and 899: Magee: Orthopedic Physical Assessment**

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JOINT PLAY OF THE LOWER LEG AND ANKLE

- Talocrural (ankle joint)**
- Subtalar Joint**
- Midtarsal Joint**
- Tarsometatarsal Joints**
- Metatarsophalangeal and interphalangeal joints**

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JOINT PLAY OF THE FOOT

Kaltenborn's 10 Tests for Tarsal Mobility

FIXATE

2ND/ 3RD cuneiforms

2ND/ 3RD cuneiforms

1st cuneiform

Navicular

Talus

Cuboid

Navicular/3rd cuneiform

Calcaneus

Talus

Talus

MOBILIZE

2nd metatarsal

3rd metatarsal

1st metatarsal

1st, 2nd, 3rd cuneiforms

Navicular

4th/5th metatarsals

Cuboid

Cuboid

Calcaneus

Tibia and Fibula

Reference: Magee: page 910: Orthopedic Physical Assessment

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FUNCTIONAL TESTS

Gold Standard

can the patient go up on their toe on the involved foot

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TREATMENT

1. **Ultrasound:** to the involved tissue

2. **Soft tissue massage**

- Posterior Tibialis
- Plantar fascia
- Adductors
- Hamstrings
- ITB

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TREATMENT

3. Manual Therapy

MET's to correct postural dysfunction
MET's/Mulligan to restore thoracic rotation

4. Kinesiotaping

5. Orthotics

6. Therapeutic Exercise

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LOWER TRUNK ROTATION



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LOWER TRUNK ROTATION ARMS OVERHEAD



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PRONE ON ELBOWS



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ADDUCTOR STRETCH



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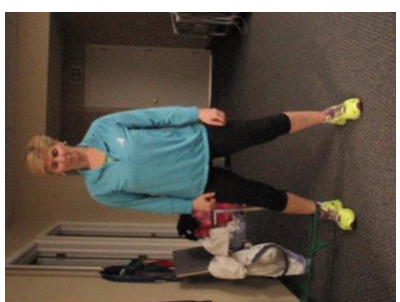
ADDUCTOR SQUEEZE



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ADDUCTOR STRENGTHENING



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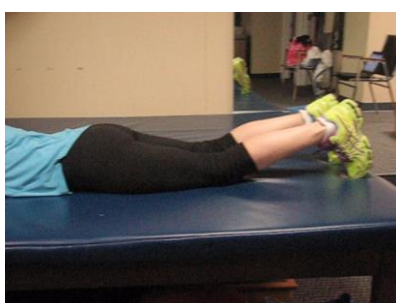
VMO RE-EDUCATION



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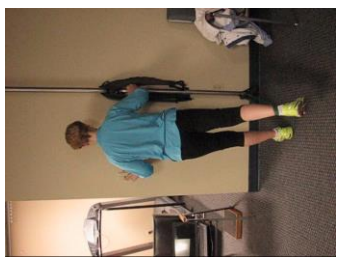
GLUTE RETRAINING



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**HIP
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WITH
THERABAND**



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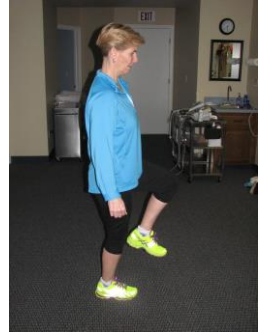
BAPS BOARD



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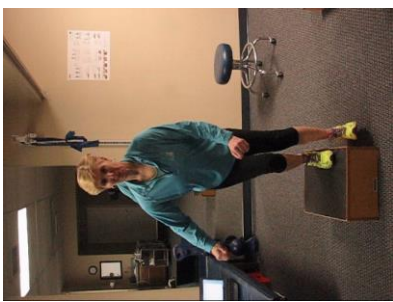
**SINGLE
LIMB
BALANCE**



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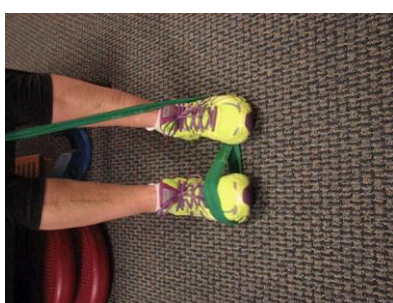
VMO RE-EDUCATION



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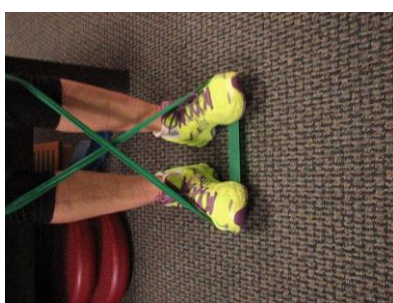
THERABAND: DORSIFLEXION



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THERABAND: EVERSION



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THERABAND: PLANTARFLEXION



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THERABAND: PLANTARFLEXION



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THERABAND: INVERSION



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**LOWER
EXTREMITY
STRENGTHEN-
ING**



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**STEP UP
TO AN
UNSTABLE
SURFACE**



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BIRD DIP




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(B) HEEL RAISE

ECCENTRIC
CONCENTRIC

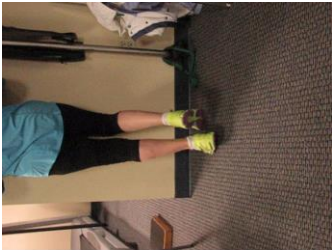


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**UNILATERAL
HEEL RAISE**

CONCENTRIC
ECCENTRIC



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HEEL WALKING

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**DYNAMIC
BALANCE
EXERCISES**



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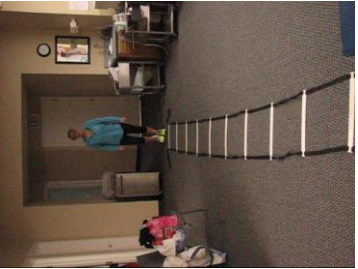
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LADDER DRILLS

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LADDER DRILLS

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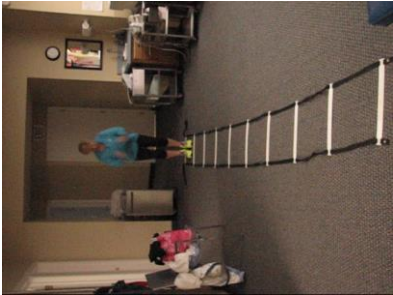


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LADDER DRILLS



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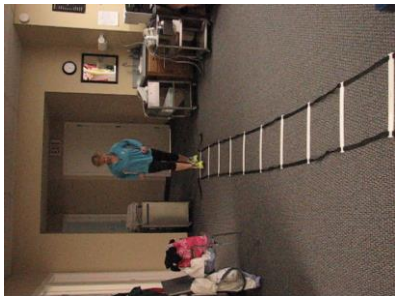
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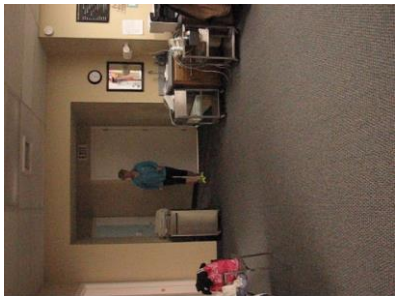
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SKIPPING



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CLOSED CHAIN ON AN UNSTABLE SURFACE



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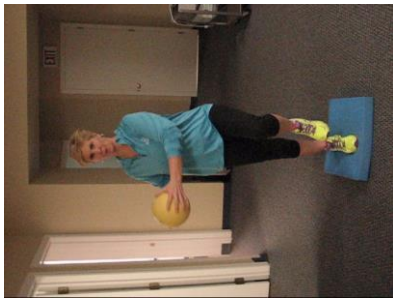
DYNAMIC BALANCE



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DYNAMIC BALANCE



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DYNAMIC BALANCE



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NEVER GIVE YOUR PATIENT ANYTHING YOU CAN'T DO!



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