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Function:
the foot bone is connected to
the head bone! Functional
Exercises & Treatment (Part 2)

Functional Exercise & Treatment
Anita Davidson PT, DPT, CAFS

Learning Objectives

• Explain functional concepts of eccentric vs concentric evaluation and treatment
• Demonstrate at least 5 new exercises for function off the plinthe
• Explain the modifications for traditional exercises to improve functional impact foot through the pelvis
Functional Treatment Follows Functional Testing…

Goal is restoring the functional chain foot to head

If we only treat locally, we risk not restoring the functional chain potentially setting the patient up for future injury
Rule of thumb:

Educate patient in 3 planes
Mobilize joints in 3 planes
Release tissues in 3 planes
Increase ROM in 3 planes
Stabilize in 3 planes

Patient education related to 3 planes of motion is critical to connect why you would want to treat the feet to help the hip.

Go back to the functional chain reaction of gait to support the why of what you prescribe.
Evidence:

Lee et al identified that tibial rotation has a strong correlation with patellofemoral disorders. They noted that the degree of knee flexion has an inverse correlation with patellar position and tibial rotation, i.e. the greater the knee flexion, the more seated the patella is into the trochlear groove and less movement occurs of the patella.

Lee TQ, Yang BY, Sandusky MD, McMahon PJ 2001
Foot Mobilization Allows for Relative Balance Between Pronation & Supination
Mid foot mobility allows for initiation of transverse plane motion & shock absorption from heel strike to push off during
If the functional chain starts with heel strike, if the foot is rigid the chain is stopped at impact.

Soft Tissue mobilization follows joint mobilization to allow motion.
Manual mobilization with movement improves the carryover into function
Functional Tri-Plane Exercises

Where do I start?

Stay Successful!

Flexibility
Muscles work in the middle 50% of their length…

Need increased muscle length to strengthen through the range of motion

Flexibility

Stretch in 3 Planes of Motion
Treatment concepts for the core and foot fit in easily with our other treatment techniques and skills

Psoas Stretches
Standing
- Reach up
- Back foot straight
- Lunge forward from hips
- Rotate away from back leg to finish the stretch
- Avoid letting the patient lead with trunk flexion or lose stretch
Psoas Stretches
Standing foot on chair
- Reach up
- Back foot straight
- Lunge forward from hips
- Rotate away from back leg to finish the stretch
- Avoid letting the patient lead with trunk flexion or lose stretch

Psoas Stretches
Kneeling
- One foot flat/on 1 knee
- Keep trunk upright
- Lunge forward from hips
- Rotate away from back leg to finish the stretch
- Avoid letting the patient lead with trunk flexion or lose stretch
Psoas Stretches
Back extensions
- Stand with hands at the low back
- Keeping your feet straight
- Bend back from the hips

Psoas Stretches
Staggered stance with other exercises
- Add one foot in front of the other with other exercises to limit psoas compensation
Hamstring Stretch

Take the usual stretches and add rotation!

- Reach across your leg
- and/or
- Rotate stretch leg in/out

Hold the stretch during the added rotation
Sitting
Reach across the leg or roll it in/out
Hip Hinge

Standing
reach across during stretch with leg extended
Hip Hinge
Standing reach across during stretch with leg extended Hip Hinge

Supine

Roll the straight leg into internal/external rotation
Pec Stretch

In door with staggered stance for psoas stretch

The same leg is back as the arm that is up

Latissimus Stretch

Combines Pectorals, Latissimus, & Quadratus
Functional exercises can provide simultaneous flexibility and strengthening benefits.

Train the muscles in 3 planes of motion…
If one plane is painful… work in pain free planes.
So how do you get rotation into your muscle training?

Our bodies want relative motion between extremes!

Clock Steps & Reaches
3 Planes of Motion
- Frontal
- Sagittal
- Transverse
Clock Steps & Reaches
3 Planes of Motion
8 Foot Directions

Right Toe In, Toe Out
Toe Straight, Alternating
Left Toe In, Toe Out,
Toe Straight, Alternating
Clock Steps & Reaches

3 Planes of Motion
8 Foot Directions
8 Arm Directions
  Bilateral, Single Arm, Alternating Arms, Alternating Planes
Clock Steps & Reaches
3 Planes of Motion
8 Foot Directions
8 Arm Directions
Static vs Dynamic
Static Feet, Static Arms
Dynamic Feet, Dynamic Arms
Clock Steps & Reaches
3 Planes of Motion
8 Foot Directions
8 Arm Directions
Static vs Dynamic
High vs Low Reaches
   Reach up works the abs
   Reach low works the gluts
Reaching overhead loads the abdominals, increasing strength and eccentric loading.

Reaching below waist level loads the gluteals, increasing strength and eccentric loading.
Evidence:
Remember Dierks et al correlation between weak Hip ER & patellofemoral pain…
How to load the gluteals to strengthen gluts in 3 planes?
Clock Steps & Reaches
3 Planes of Motion
8 Foot Directions
8 Arm Directions
Static vs Dynamic
High vs Low Reaches
Progress from static to dynamic for agility training
GlutFamily: Maximus, Medius, Minimus

Degrees of External Rotation…

to get more Max, add more rotation!
**Sit Back Reach**

We want a hip hinge to eccentrically load the gluteals. Play with rotation degrees with reaching. Straight = sagittal, Across = transverse.

Look for compensations in form that will decrease the gluteal loading. Locked lordosis increases psoas and avoids gluts.
**Sit Back Reach**

Have patient reach down and watch their hands to soften the back and avoid psoas locking.

Reach down and across to increase glut loading.

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**Sit Back Reach**

Cue to keep the toes point straight ahead especially if the patient is a chronic hip external rotator.

Toe out puts the gluteals on slack with less eccentric.
**Sit Back Reach**

The knee over the heel keeps the work load to the gluteals. If the knee floats forward, the work load shifts to the quad for every degree of forward motion.

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**Keep the knee over the heel!**

*If the knee floats forward over the foot, the line of force moves through the knee joint causing a shearing force and strain on the patellar tendon.*
Sit Back Reach
Cue to keep the toes point straight ahead especially if the patient is a chronic hip external rotator
Toe out puts the gluteals on slack with less eccentric

If the knee floats over the foot, the work load shifts to the quad and hamstring and lets the glut off the hook.
Patient may have medial/patellar tendon pain and not strengthen the butt!
If you want to focus on one leg for deficit can do single leg sit back either by propping the other toe for balance and sit back reaching low and across with the opposite arm.
Can challenge with different surfaces…

…for higher level patient function
Can mix step reaches in different planes with sit backs

Take an exercise you know and add another plane of movement
Add hip abduction and adduction with static bridge to increase hip rotators, pelvic floor, foot mobility.

Add hip rotation with a static bridge to increase abdominal activation, hip rotators, foot mobility.
Load the glut/hamstring

Single Balance Reach Low to High

Load the abs
Single leg balance cone reaches 75

Add overhead reach to load abdominals
Be aware of hip position for psoas compensation

Evidence:
Boren et al evaluated 24 healthy subjects with surface EMG performing 18 exercises that are commonly used for gluteus maximus and medius strengthening. Highest maximal voluntary muscle contraction values achieved from 70-100% for gluteus medius included side plank/abduction (dominant leg top & bottom), single limb squat, clamshell, and front plank with hip extension. Gluteus maximus activation was greatest with front plank with hip extension, glut set, side plank with abduction (dominant leg top & bottom). This study assists with ranking gluteal strengthening exercises in rehab.

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Boren K, Conrey C, LeCogoic J, Paprocki L, Voight M, Robinson TK, JOSPT 2011

… When you identify asymmetry in strength/flexibility

… train asymmetrically until the weak/tight side is equal ….

Then balance the activities
Common History:

Current right shoulder impingement

4 yrs ago—plantarfasciitis left foot

10 yrs ago—onset of intermittent LBP

Weight gain of 20# over past year

Common History:

Plantarfasciitis left foot:

• Psoas restriction on the right hip limiting swing phase on the right with a hard impact?

• Poor mid-foot control on the left foot?

• Poor hip eccentric control on the left?
Common History:

Intermittent Low Back Pain:

• Psoas hypertonicity on one or both sides to stabilize the trunk/pelvis?
• Gluteal weakness in eccentric function resulting in harder impact with gait?
• Loss of transverse plane motion at the trunk/hips to the feet reducing eccentric control?

Common History:

Weight Gain of 20#:

• Psoas hypertonicity for trunk stabilization
• Decreased trunk rotation?
• Increased static hip ER for stabilization turning off the gluteals?
Common History:

Current Right Shoulder Impingement:

- Psoas restriction on the right hip restricting trunk rotation and limiting swing phase on the right with a hard impact?
- Poor mid-foot control on the left foot?
- Poor hip eccentric control on the left?

Diagnosis: Plantarfasciitis

Cause: Rigid mid foot limiting shock absorption through the foot paired with weakness at the hip not controlling eccentric rotational motion and tight psoas on the contralateral leg

Assessment clues:
- Lack to relative change with reaches
- Weakness with floor reaches
- Quad dominance with sit backs
Diagnosis: Plantarfasciitis
Treatment:
- Foot mobilizations to allow for transverse plane
- Psoas stretches to decrease heel impact in gait/increase gluts
- Eccentric hip to foot training to support relative pronation and/or supination
- Sit backs, Floor reaches

Diagnosis: Medial Knee Pain
Cause: Rigid mid foot limiting shock absorption through the foot paired with weakness at the hip not controlling eccentric rotational motion and tight psoas on the contralateral leg
Assessment clues:
- Lack to relative change with reaches
- Weakness with floor reaches
- Quad dominance with sit backs
Diagnosis: Medial Knee Pain
Treatment:
Foot mobilizations to allow for transverse plane
Psoas stretches to decrease heel impact in gait/increase gluts
Eccentric hip to foot training to support relative pronation and/or supination
Sit backs, Floor reaches

Diagnosis: Patellofemoral Pain
Cause: Rigid mid foot limiting shock absorption through the foot paired with weakness at the hip not controlling eccentric rotational motion and tight psoas on the contralateral leg
Assessment clues:
• Lack to relative change with reaches
• Weakness with floor reaches
• Quad dominance with sit backs
Diagnosis: Patellofemoral Pain
Treatment:
- Foot mobilizations to allow for transverse plane
- Psoas stretches to decrease heel impact in gait/increase gluts
- Eccentric hip to foot training to support relative pronation and/or supination
- Sit backs, Floor reaches

Diagnosis: Low Back Pain
Cause: Tight psoas reducing hip/pelvis and lumbar transverse plane motion with weakness in the gluteals for eccentric/concentric stabilization.

Lack of mid foot motion may also assist in vertical compressive forces from the foot through the spine
Diagnosis: Low Back Pain

Assessment clues:
- Hard impact with heel strike in gait indicating tight psoas
- Hip ER with posture and gait resulting in slack gluteals
- Poor relative change with reaches
- Poor eccentric control for floor reaches and sit back tests with locked lordosis
- Correlation of psoas/hamstring with SLR

Diagnosis: Low Back Pain

Treatment:
- Foot mobilizations to allow for transverse plane
- Psoas stretches to decrease heel impact in gait/increase gluts
- Eccentric hip to foot training to support relative pronation and/or supination
- Sit backs, Floor reaches
Math Question

How long would it take a patient to strengthen/stretch the muscles of the hip/knee/calf traditionally compared to a total body approach to function?

3 sets of 10 for strength
3 reps for 20 seconds stretches

Math Question

<table>
<thead>
<tr>
<th>Traditional Sagittal</th>
<th>Triplane/Combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calf stretch</td>
<td>Psoas/calf stretch</td>
</tr>
<tr>
<td>Hamstring stretch</td>
<td>Hamstring stretch</td>
</tr>
<tr>
<td>Quad stretch</td>
<td>Single leg balance</td>
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<tr>
<td>SLR</td>
<td>reach low</td>
</tr>
<tr>
<td>Quad Set</td>
<td>Sit back reaches</td>
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<tr>
<td>Hamstring curls</td>
<td></td>
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<tr>
<td>Toe rises</td>
<td></td>
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<tr>
<td>Hip extension</td>
<td></td>
</tr>
</tbody>
</table>

Which is more efficient?
Summary
Assess in 3 Planes of Motion

Treat in 3 Planes of Motion

Educate in 3 Planes of Motion

Load the glut/hamstring

Single Balance Reach Low to High

Load the abs
How do you load the core muscles?

Lengthen under a load!

Problem:

psoas stabilizes in the absence of the core & gluteals
Psoas acts as load blocker

Glut max shuts down & loses its primary function during gait

Solution:

Restore the Chain Reaction!
Restore the chain by lengthening the psoas and strengthening the gluts/abs!

Add a psoas stretch to RTC exercises to inhibit & retrain psoas while activating the core stabilizers
How can we train our patients for this?
There are a lot of ways to get to the same outcome…

Using all 3 planes can be faster

My truths in clinical care:

Pain is not a requirement of life

Our patients tell us what’s wrong

All roads lead back to the psoas

The foot bone is connected to the head bone!
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Founder CREAT
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THANK YOU!