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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

4

Functional Treatment Follows Functional Testing…

Goal is restoring the functional chain foot to head

5

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

6

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

7

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

8

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

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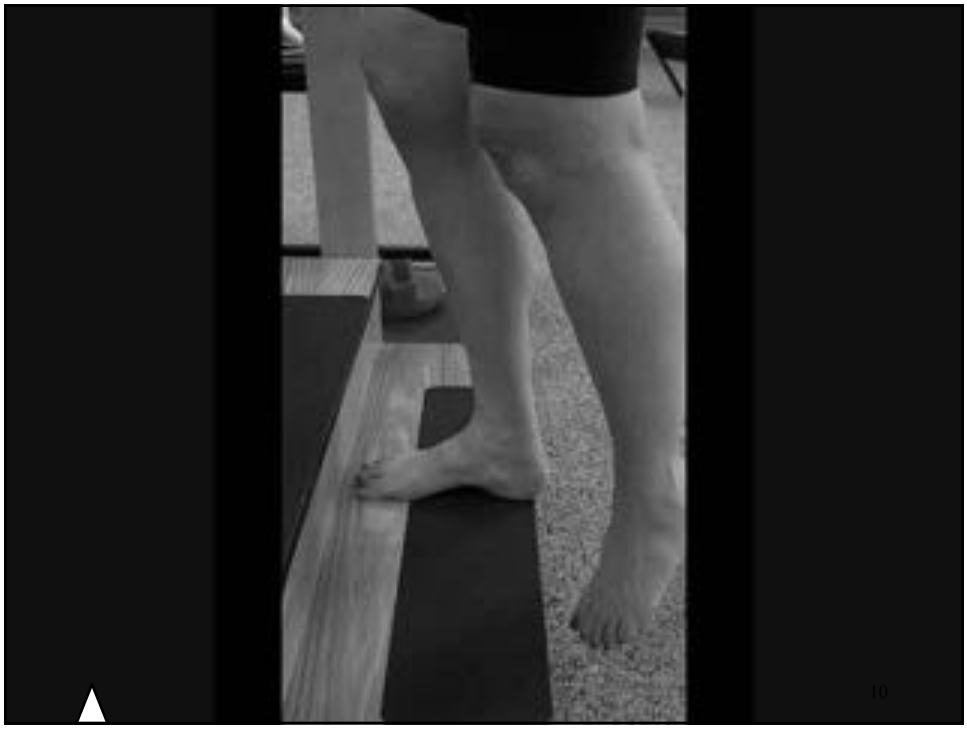

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Foot Mobilization Allows for Relative Balance Between Pronation & Supination

11

12

Mid foot mobility allows for initiation of transverse plane motion & shock absorption from heel strike to push off during

13

14

If the functional chain starts with heel strike, if the foot is rigid the chain is stopped at impact

15

Soft Tissue mobilization follows joint mobilization to allow motion

16

Manual mobilization with movement improves the carryover into function

Functional Tri-Plane Exercises

Where do I start?

Stay Successful!

19

20

Muscles work in the middle 50% of their length…

Need increased muscle length to strengthen through the range of motion

21

Flexibility

Stretch in 3 Planes of Motion

22

Treatment concepts for the core and foot fit in easily with our other treatment techniques and skills

23

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

24

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

25

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

26

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 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

30

Sitting Reach across the leg or roll it in/out Hip Hinge

31

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

34

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

36

Functional exercises can provide <u>simultaneous</u> flexibility and strengthening benefits

37

Train the muscles in 3 planes of motion…

If one plane is painful…

work in pain free planes

38

So how do you get rotation into your muscle training?

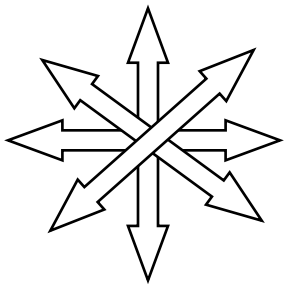
Our bodies want relative motion between extremes!

39

Clock Steps & Reaches

3 Planes of Motion

- Frontal
- Sagittal
- Transverse



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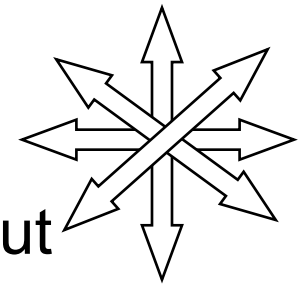
Clock Steps & Reaches

3 Planes of Motion

8 Foot Directions



Right Toe In, Toe Out

Toe Straight, Alternating

Left Toe In, Toe Out,

Toe Straight, Alternating

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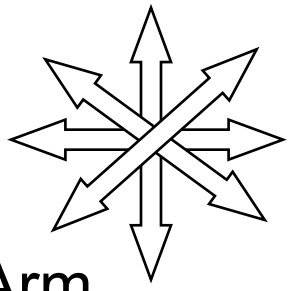
Clock Steps & Reaches

3 Planes of Motion

8 Foot Directions

8 Arm Directions



Bilateral, Single Arm, Alternating Arms, Alternating Planes

43

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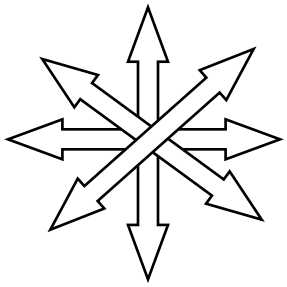
Clock Steps & Reaches

3 Planes of Motion

8 Foot Directions

8 Arm Directions



Static vs Dynamic

- Static Feet, Static Arms
- Dynamic Feet, Dynamic Arms

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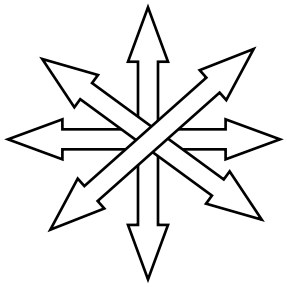
Clock Steps & Reaches



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

48

Reaching overhead loads the abdominals increasing strength and eccentric loading

Reaching below waist level loads the gluteals increasing strength and eccentric loading

50

51

Evidence:

Remember Dierks et al correlation between weak Hip ER & patellofemoral pain…

How to load the gluteals to strengthen gluts in 3 planes?

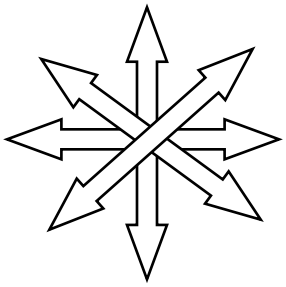
52

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

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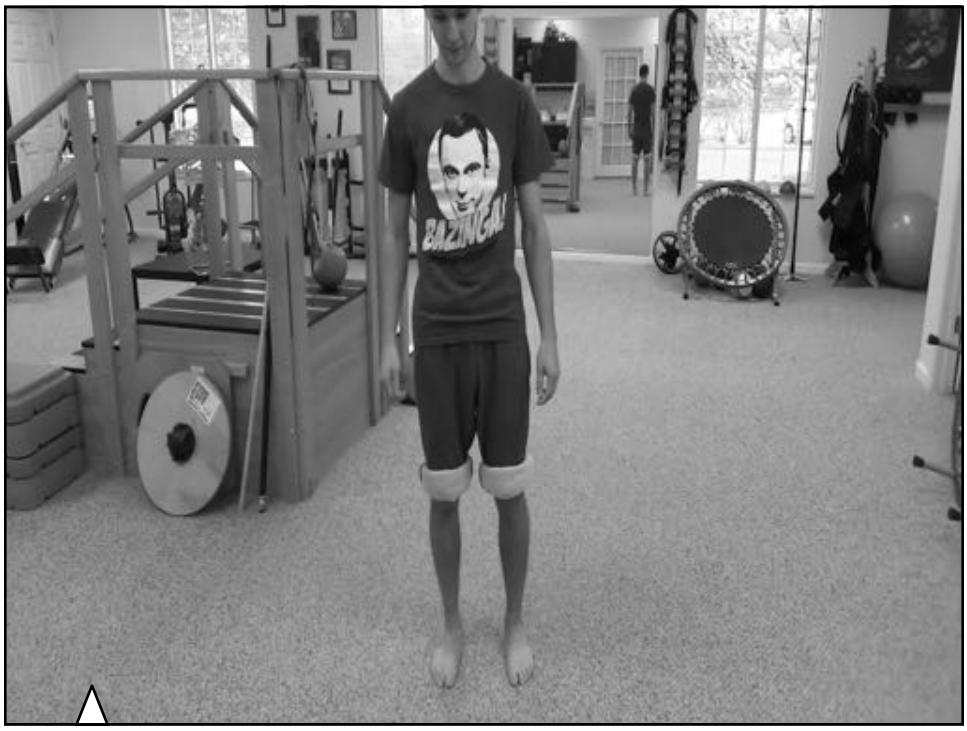
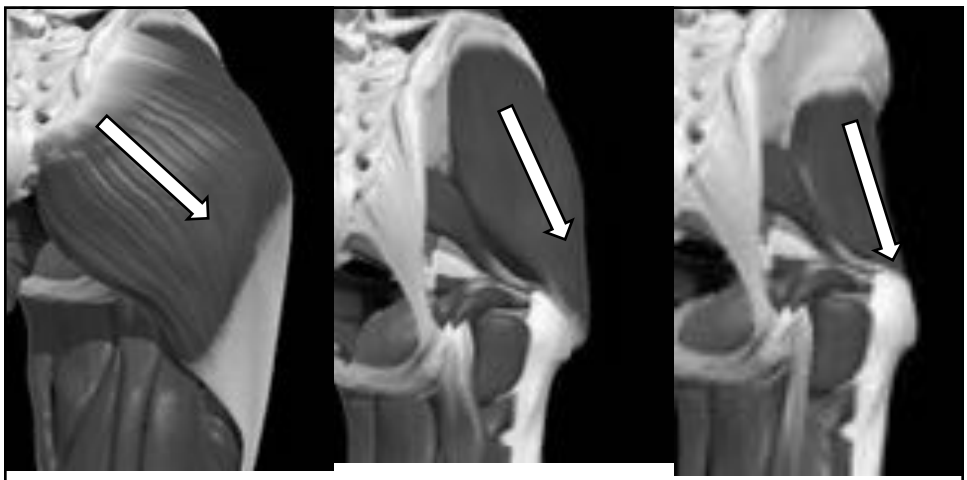




GlutFamily: Maximus, Medius, Minimus

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

57

Sit Back Reach

Look for compensations in form that will decrease the gluteal loading

Locked lordosis increases psoas and avoids gluts

58

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

59

Sit Back Reach

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

Toe out puts the gluteals on slack with less eccentric

60

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

61

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

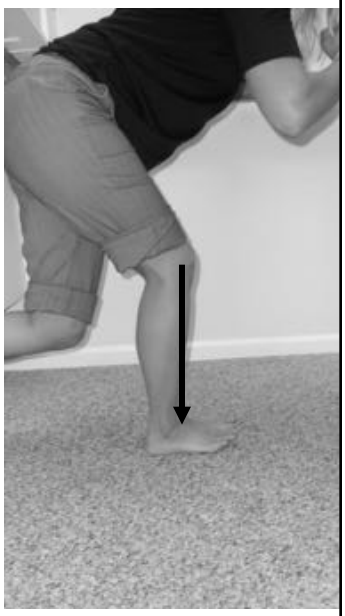
Cue to keep the toes point straight ahead especially if the patient is a chronic hip external rotator

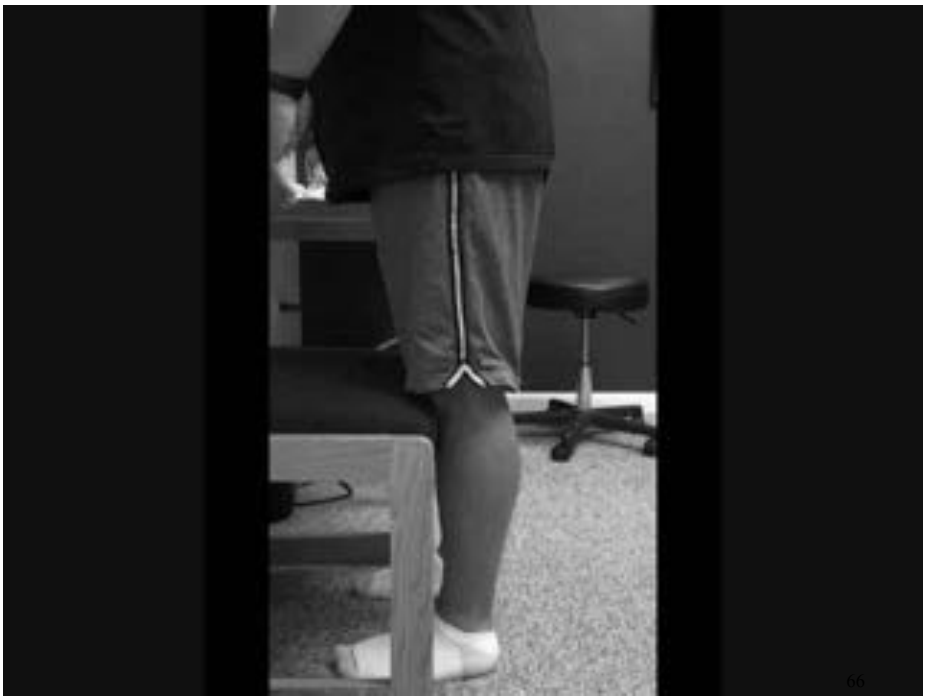
Toe out puts the gluteals on slack with less eccentric

63

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…

67

…for higher level patient function

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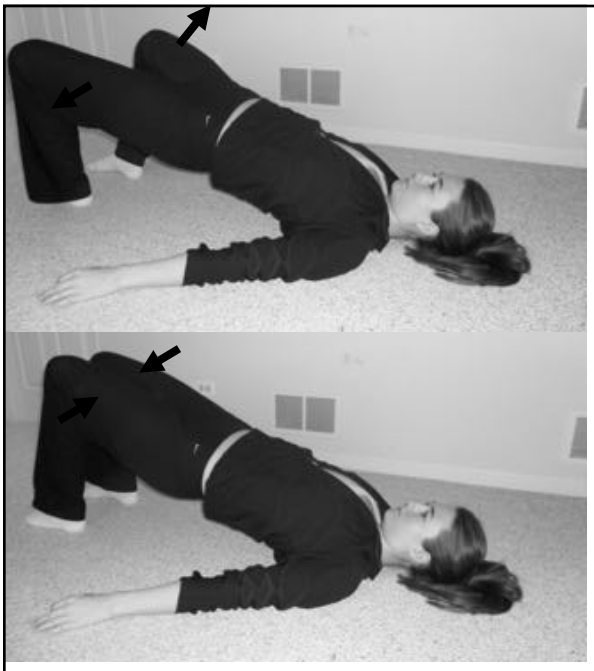
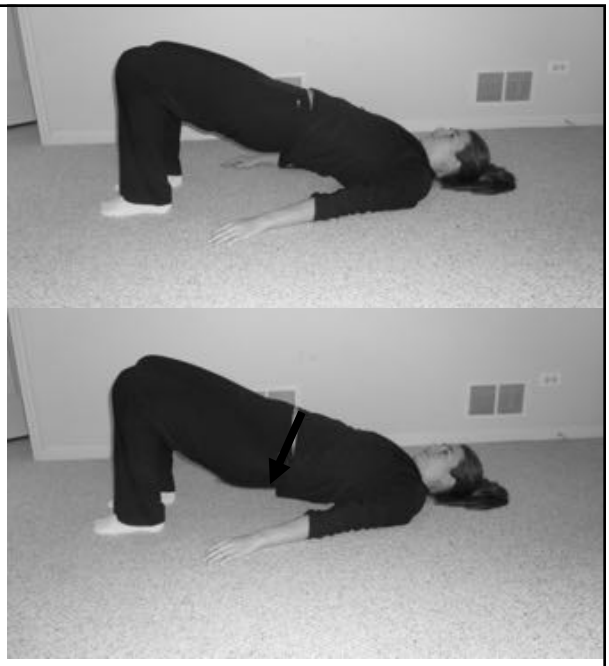
Can mix step reaches in different planes with sit backs



Add hip abduction adduction with static bridge to increase hip rotators, pelvic floor, foot mobility

71

Add hip rotation with a static bridge to increase abdominal activation, hip rotators, foot mobility



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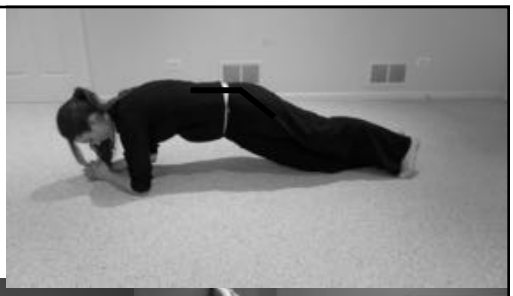
Load the glut/hamstring
Load the abs
Single Balance Reach Low to High


Single leg balance cone reaches
75


Add overhead reach to load abdominals
76

Be aware of hip position for psoas compensation



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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.

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

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What About Rotation???

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

79

… When you identify asymmetry in strength/flexibility

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

Then balance the activities

80

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

81

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?*

82

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?*

83

Common History:

Weight Gain of 20#:

- *Psoas hypertonicity for trunk stabilization*
- *Decreased trunk rotation?*
- *Increased static hip ER for stabilization turning off the gluteals?*

84

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?*

85

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

86

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

87

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

88

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

89

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

90

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

91

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

92

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

93

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

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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

95

Math Question

Traditional Sagittal	Triplane/Combination
Calf stretch Hamstring stretch Quad stretch	Psoas/calf stretch Hamstring stretch
SLR Quad Set Hamstring curls Toe rises Hip extension	Single leg balance reach low Sit back reaches

Which is more efficient?

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Summary

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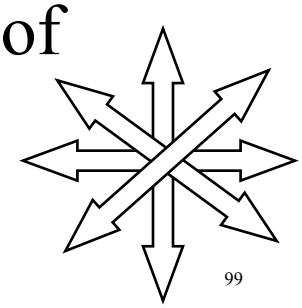
Assess in 3 Planes of Motion

Treat in 3 Planes of Motion

Educate in 3 Planes of Motion



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How do you load the core muscles?

Lengthen under a load!

101

Problem:

psoas stabilizes in the absence of the core & gluteals

102

Psoas acts as load blocker

Glut max shuts down & loses its primary function during gait

103

Solution:

Restore the Chain Reaction!

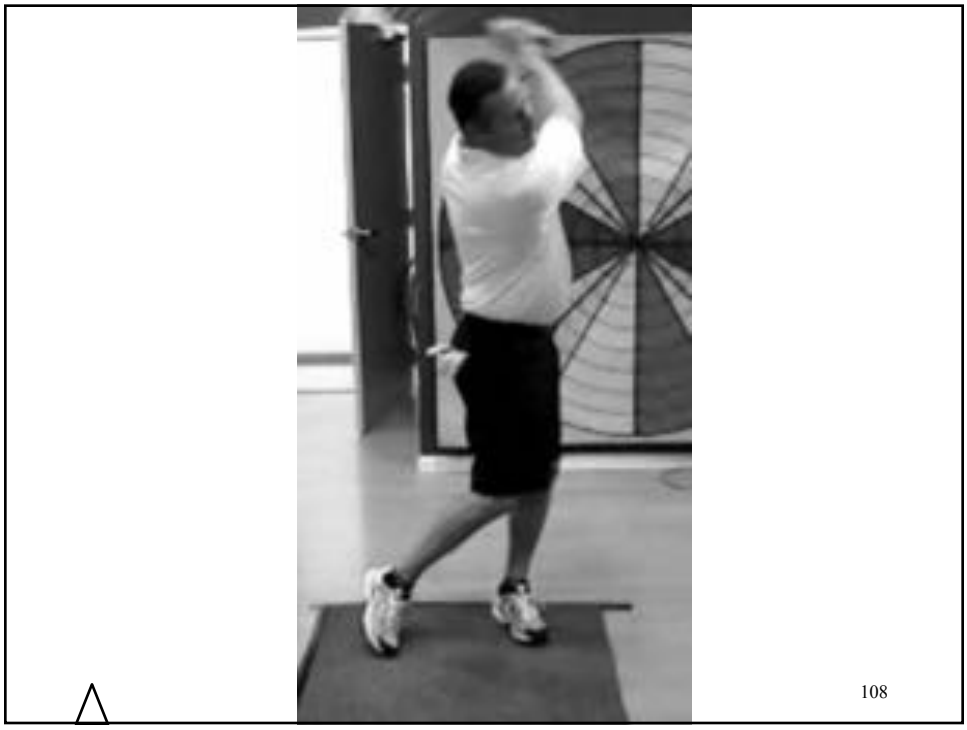
104

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

105

Add a psoas stretch to RTC exercises to inhibit & retrain psoas while activating the core stabilizers


How can we train our patients for this?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There are a lot of ways to get to the same outcome…

Using all 3 planes can be faster

109

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!

110

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Founder *CREAT*

Creative Research, Education & Training

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THANK YOU!

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