CLINICAL NEURODYNAMICS LOWER

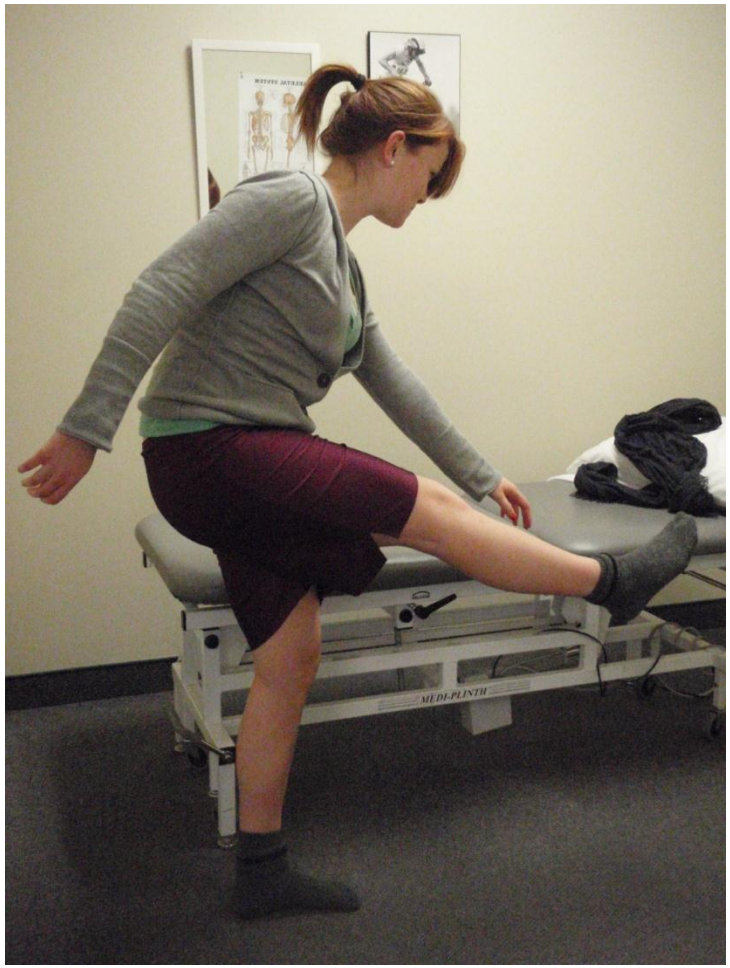
Prepared by Teresa Gravelle

Level 3 Lower, 2011

3 normal functions of the NS

(Shacklock)

- Withstand tension
- Slide in its container
- Be compressible



General System of Technique Selection (diagnosis and treatment) Shacklock

Physiological → Mechanical

Contraindicated **Standard** **Sensitised**

Level 0 — 1 — 2 — Level/ type 3

Limited

- a. Neurodynamically sensitised
- b. Neurodynamic sequencing
- c. Multistructural
- d. Symptomatic post./movement.
- e. Prior activity

LOWER LIMB NEURODYNAMIC TESTING

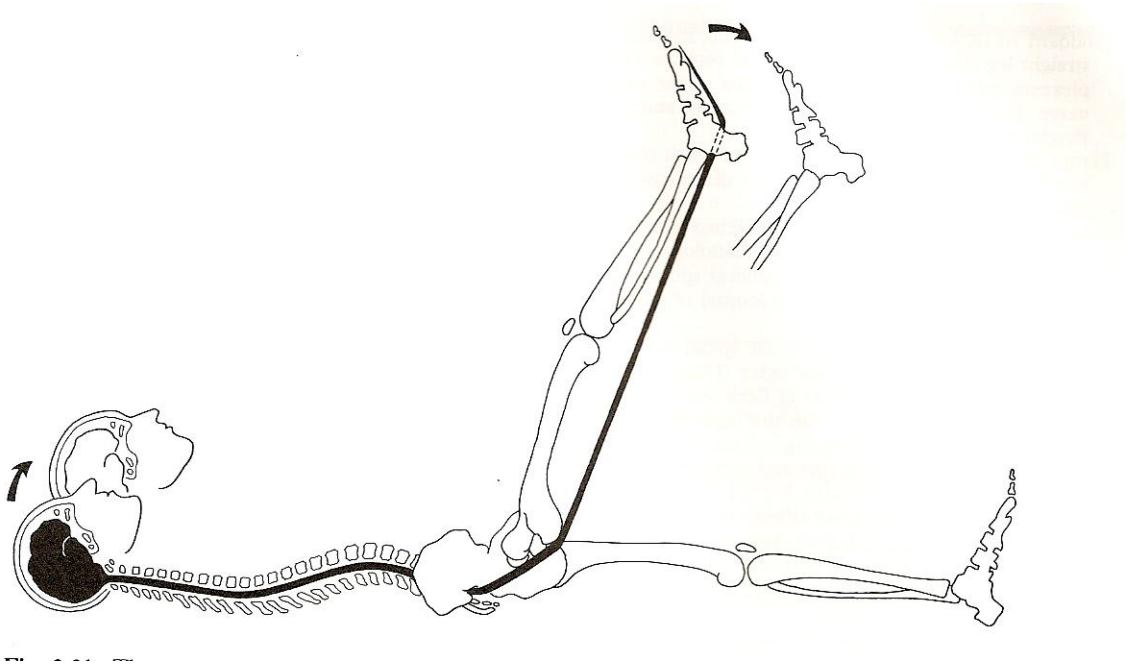
Butler

- Note range, symptom response and resistance through the movement

Straight Leg Raise Butler

- Supine, trunk and hips neutral, no pillow or same pillow, one hand under Achilles and one hand at knee to maintain extension
- Tests aspects of nervous system mechanics from brain to toes, including sympathetic trunk
- 2 ways of including sensitizing into tension test
- Movement could be included first DF-SLR or at a certain range of the SLR, the sensitizing addition could be included SLR-DF

Straight Leg Raise



SLR: Variations Butler

Ankle dorsiflexion

- tension along tibial tract
- SLR-DF-EV – tibial aspect
- SLR-DF-IN – sural nerve

Ankle plantarflexion inversion

- tension along common peroneal tract
- shin splints, chronic ankle sprains

Hip adduction

- sciatic nerve lateral to ischial tuberosity

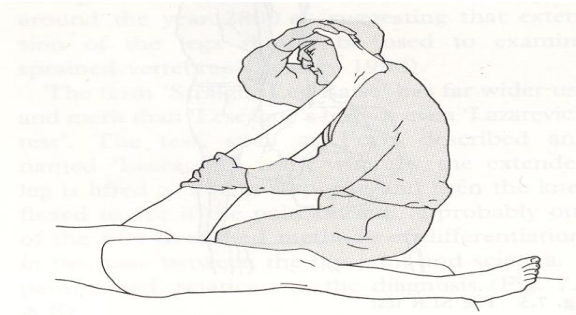


Fig. 7.6 SLR/Dorsiflexion

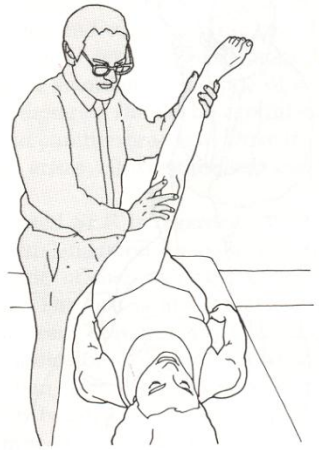


Fig. 7.10 SLR/Hip adduction

SLR: Variations Butler

- Hip medial rotation
  - tension to sciatic tract
  - nerve root moves cephalad in neutral
  - may sensitize common peroneal division more than tibial division of sciatic nerve

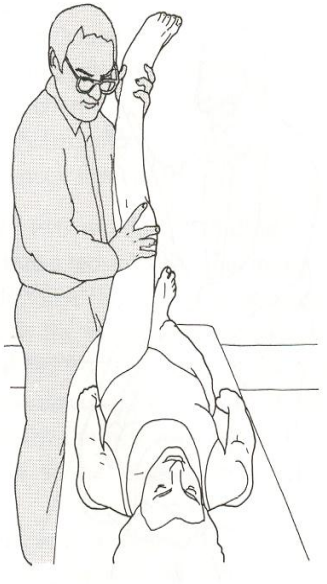


Fig. 7.11 SLR/Hip medial rotation

- Passive neck flexion – cervical flexion before or after SLR

SLR Modified Butler

- Eg. Superior, Inferior gluteal nerves, branch of lumbosacral plexus
  - Hip add/IR then SLR foot in neutral
- Piriformis
- Bilateral SLR

Fig. 7.10 SLR/Hip adduction

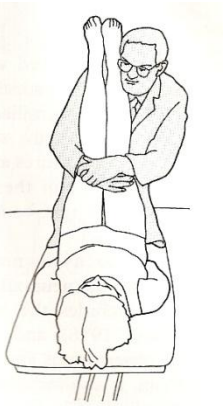


Fig. 7.15 Bilateral Straight Leg Raise

Slump Test: Butler

Non-symptomatic patient

Sitting with hands behind back

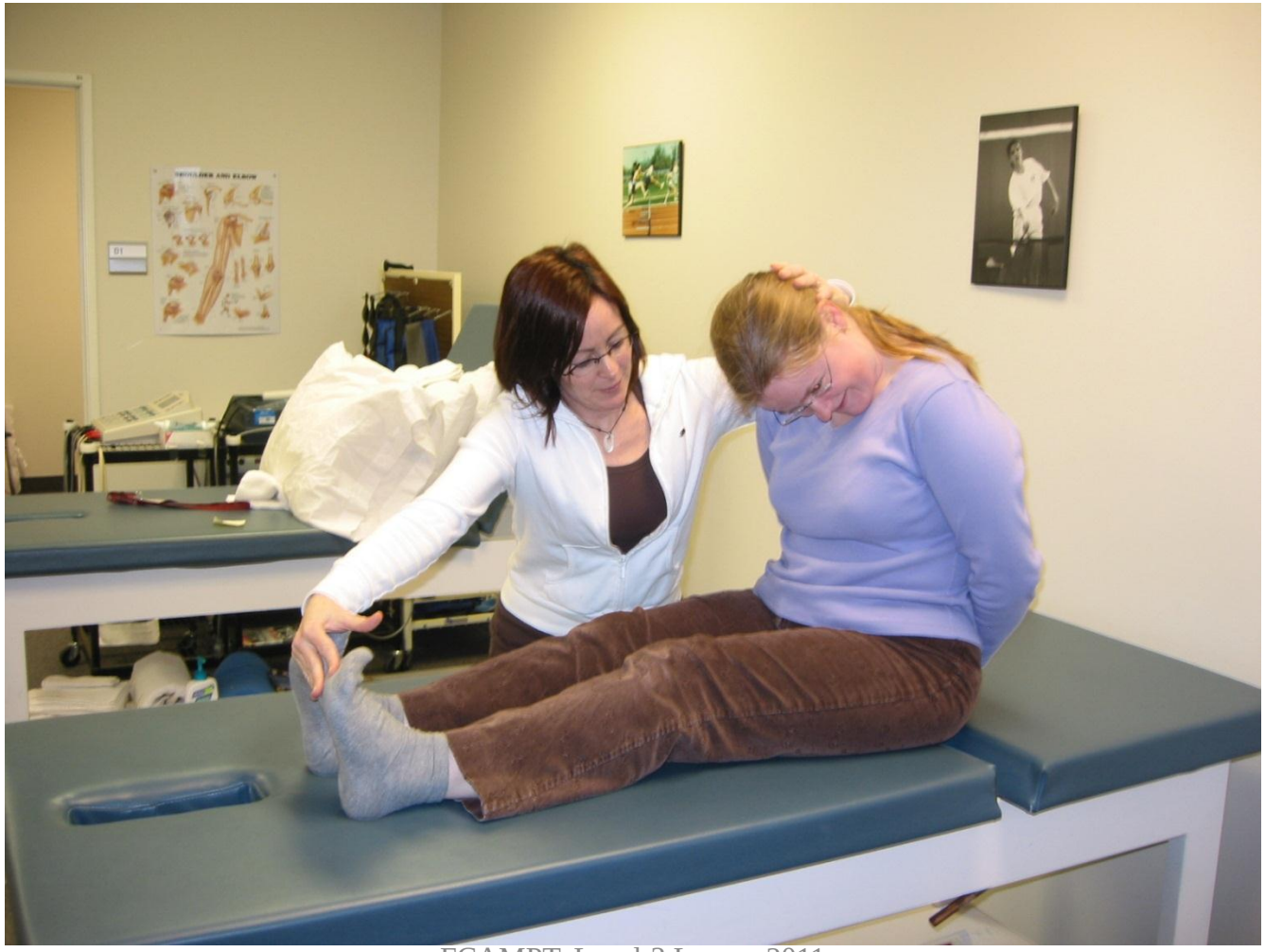
- Slump (thoracic & lumbar flexion) with neutral C-spine
- Cervical flexion – chin to chest with overpressure added
- Active knee extension – asymptomatic side first
- Ankle dorsiflexion – bend your ankle up
- Neck flexion released – response assessed
- Same procedure for other leg
- Slump position – both knees extended – monitor effect or release of neck flexion

Slump

Slump Test in Long Sitting: Butler

- Patient sits long sitting
- Add ankle dorsiflexion
- Trunk flexion with overpressure
- Neck flexion
- Cervical rotation
- Observe effect of knee flexion

Slump Longsitting



SLUMP: Precautions

- The whole test does not have to be performed
- If a disorder is irritable, part of the Slump test can be examined.
- If there is any possibility of an unstable discogenic disorder, the test should either not be performed or performed short of onset of symptoms.

Prone Knee Bend: Butler

- Prone with head turned towards physiotherapist – grasp lower leg to move into knee flexion
- May lift buttocks or try to rotate hips
- could also be muscle, fascia
- For anterior thigh, hip and upper lumbar symptoms
- More sensitive with hip in neutral than hip extension for femoral nerve

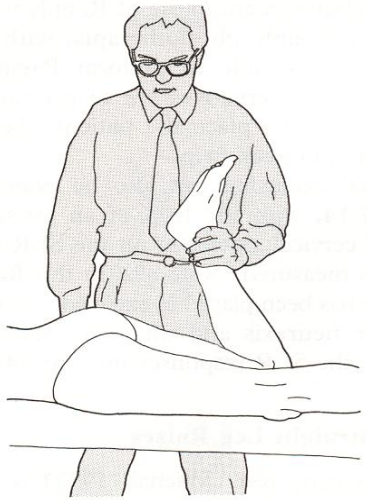


Fig. 7.16 Routine Prone Knee Bend

Variations of PNB: Butler Slump- PNB

- Sidelying
- Differentiate nervous system involvement from non-nervous system structures

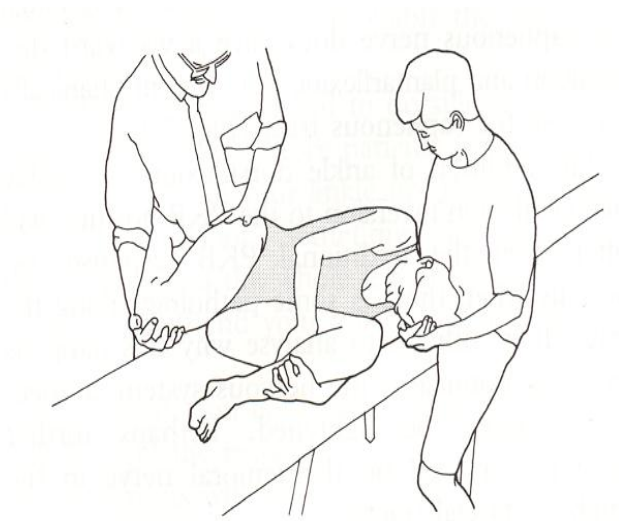


Fig. 7.18 Slump/Prone Knee Bend

Variations of PKB: Butler

- Prone Knee Bend – hip extension
  - Lateral femoral cutaneous nerve entrapment in Meralgia paraesthetica
- Prone Knee Bend – with hip abduction or adduction
  - Minor alterations – add for LFC nerve & abd for obturator nerve

Saphenous Nerve Test: Butler

- Femoral nerve continues medial to knee as saphenous nerve with cutaneous supply at instep
- Saphenous nerve runs behind axis of knee flexion and knee extension and in PKB will be lax
- Prone – extended leg is abducted, knee extended, hip extended and laterally rotated
- Eversion and dorsiflexion added or plantarflexion and inversion

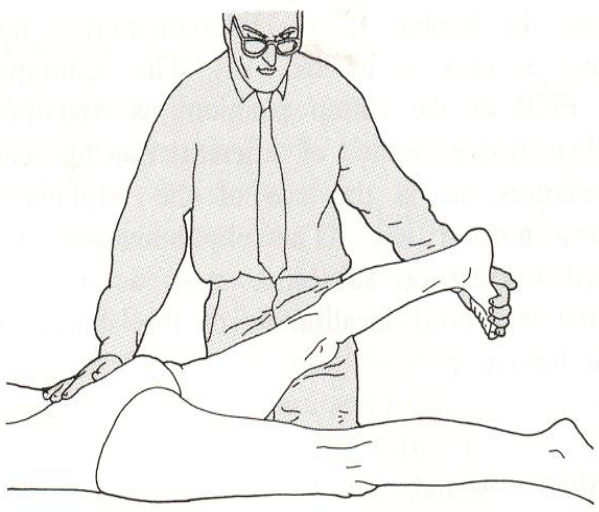


Fig. 7.19 The saphenous nerve tension test

SPECIFIC DYSFUNCTIONS (Shacklock)

- Mechanical Interface
- Neural
- Innervated Tissue

MECHANICAL INTERFACE (Shacklock)

- Pain predominantly nocigenic: aches and pains
- Neurological and dysasthesia less common: only in severe cases
- Both mechanical and inflammatory in behaviour
- History of injury or pathology
- Manual testing shows altered movement of the interface

MECHANICAL INTERFACE (Shacklock)

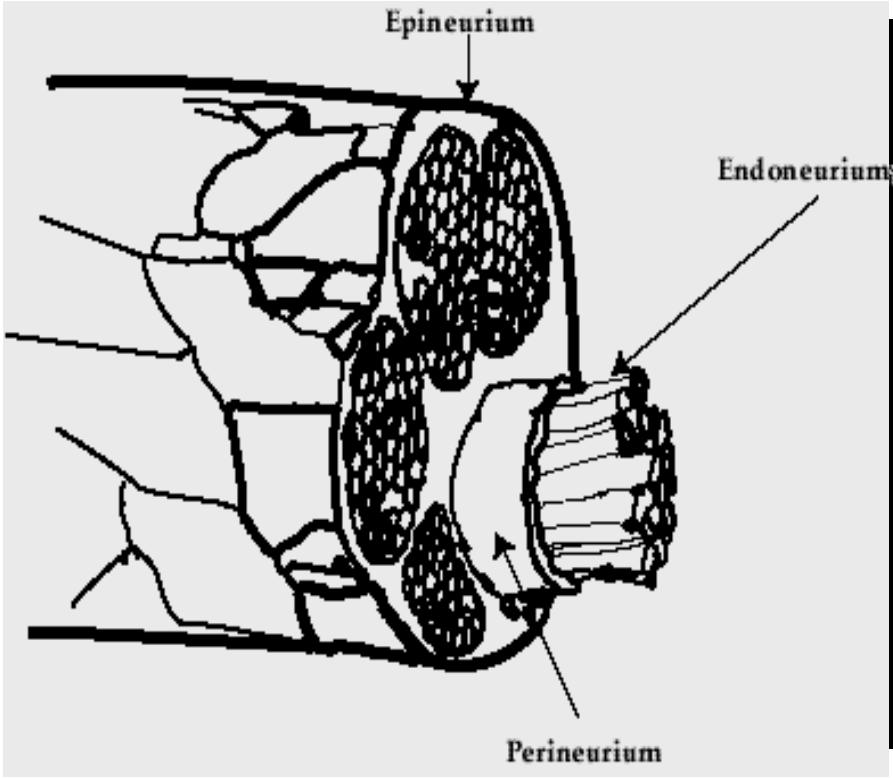
- Interface palpation abnormal
- Neurodynamic Testing: abnormalities in ND testing less significant than abnormalities of the interface except for severe cases
- Need to alter sequencing of test
- May get painful arc in ND test
- Normal Neurological exam

Example: Femoral Nerve Interface

- One interface is the upper lumbar region

NEURAL DYSFUNCTION (Shacklock)

- Neural Sliding
- Neural Tension
- Hypermobility
- Pathoanatomical
- Pathophysiological



Links between Pathomechanics & Pathophysiology (Kobayashi et al)

- Reduced movement of Lumbar nerve roots correlates with:
- Reduced intraradicular blood flow
- Scar tissue
- Symptom production at the same ROM as the reduction in blood flow occurred
- Sciatica patients
- Correction reversed these changes

Neural SlidingDysfunction (Shacklock)

- Tethering around the neural structure
- Symptoms along the line of the neural tract correlate with stress and strain along the nerve
- History of interface dysfunction, repetitive movements accompanied by an acute inflammatory reaction

Neural Sliding Dysfunction (Shacklock)

- In the ND position, the addition of further movement produces a reduction in symptoms
- Sensitive to palpation at the point of fixation
- Reduced lateral movement of the nerve
- Tissue changes around the nerve

Neural Tension Dysfunction (Shacklock)

- Lack of elongation of the neural structure or increased sensitivity to tension during daily movements
- Symptoms range from aches and pains to neural
- Loss of ROM when the nerve is under tension

Neural Tension Dysfunction (Shacklock)

- Easily detected by standard ND tests as tension is the primary mechanism of these tests
- ND tests show decreased ROM and usually reproduce the patient's symptoms
- Palpation reveals tenderness along the tract of the nerve

Neural Progressions

Tension Dysfunctions

1. Position OUT - position OUT
   ipsilateral contralateral
2. Position OUT - move OUT
   ipsilateral contralateral
3. Position IN - move OUT
   ipsilateral contralateral
4. Position OUT - move IN
   contralateral ipsilateral
5. Position IN - move IN
   contralateral ipsilateral

Level 1 → Level 2-3

Physiology → Mechanics

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Neural Tension Dysfunction: Neural Progressions for R sciatic Nerve

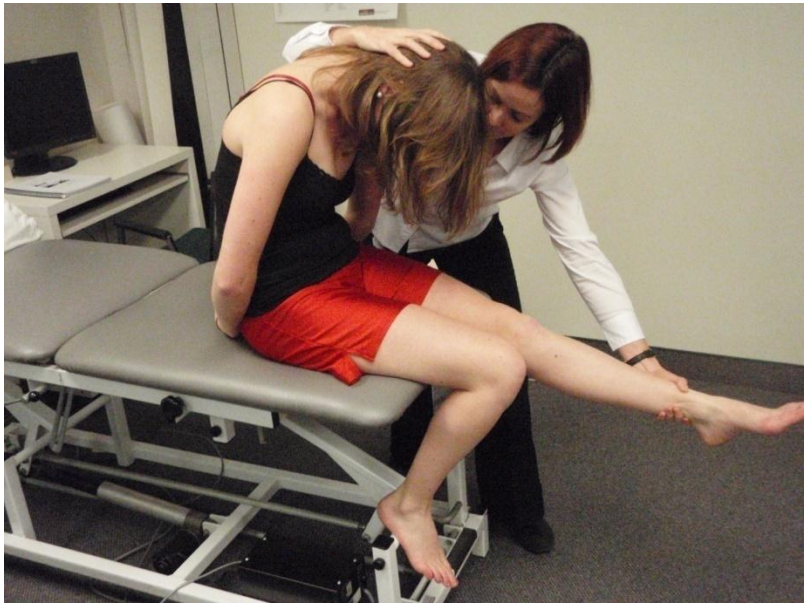
- 1. Position OUT of tension (ipsi)/ Position OUT of tension (contra): Generic off-loaded position for the sciatic nerve (high irritability)
- 2. Position OUT (ipsi)/ Move OUT (contra)

Neural Progression Cont'd

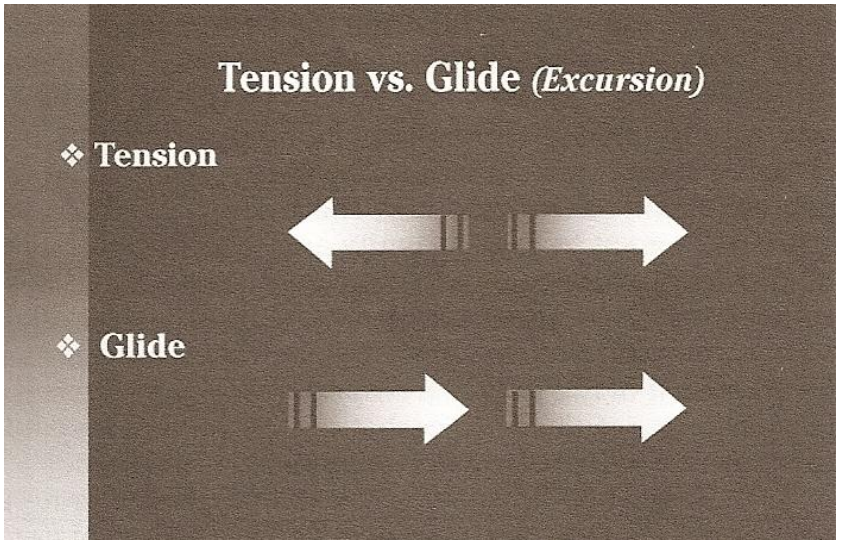
- 3. Position IN (Ipsi)/ Move OUT (Contra)
- 4. Position OUT (contra)/ Move IN to tension (ipsi)

Neural Tension Progression

- 5. Position IN (contra)/ Move IN (Ipsi): move into standard neurodynamic testing postion

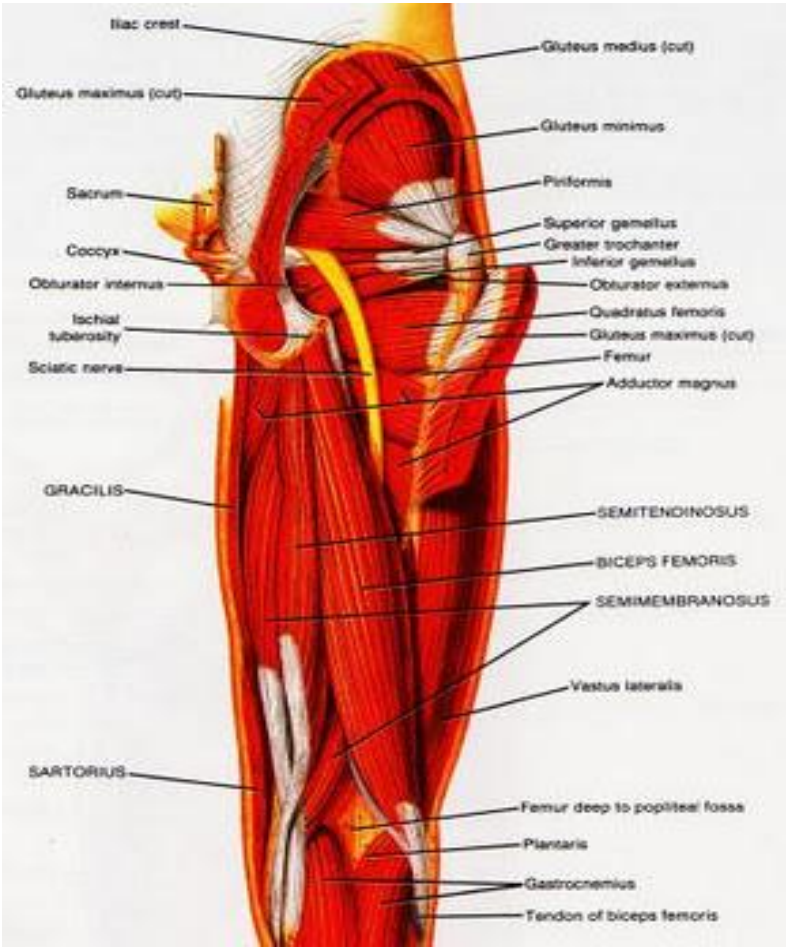


Treatment Approaches: Butler



- Mobilize interface structures out of then towards tension position
- Start with remote component painfree oscillatory movements
- Gliding vs Tension movements

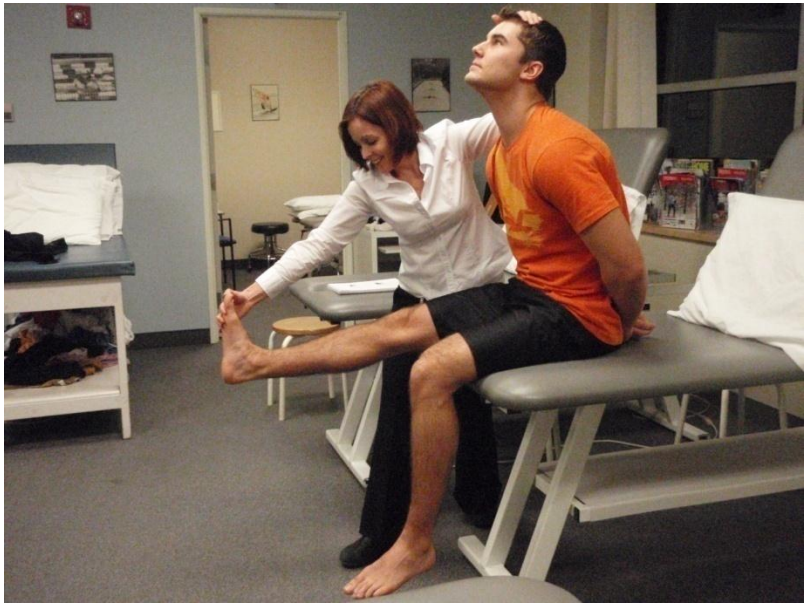
Example of Interface & Neural: Hamstring and Sciatic Nerve



Eg. Hamstrings Strain: Combined Neural & Interface

- Irritable problem: assess and treat with limited movement of the interface
- Modified slump with minimal knee extension

Hamstring Strain Assessment: Less Irritable



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Hamstrings: Treat interface in neurally unloaded position initially

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Hamstrings (low irritability): Combine Interface & Neural Treatment

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Mechanical Interface: Decreased Closing Dysfunction (Shacklock)

- Predominantly distal symptoms: neurological signs, parasthesia
- Symptoms provoked by closing movements: E/Ipsi SF
- Reduced ROM closing movements
- Treatment is aimed at reducing pathophysiology in nerve root rather than mechanical dysfunction

Mechanical Interface: Decreased Closing Dysfunction (Shacklock)

- Test mechanism of closing at the same time as the ND test
- Treat: If irritable, opening techniques initially
- Gradually move into closing direction with addition of ND tests

Closing Dysfunction:
Opening Techniques Initially

Reduced Closing with Neural Tension Dysfunction (non-irritable)

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Home Program Examples: Butler

Fig. 11.10 The hurdler's stretch — combining Prone Knee Bend and the Straight Leg Raise

Fig. 11.15 Reading longsitting in bed replicated the Slump Longsitting position

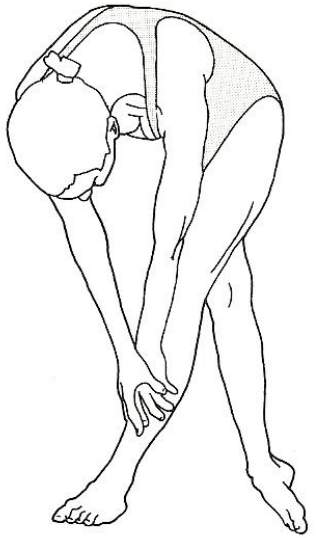


Fig. 11.9 Standing Slump with the foot in plantar flexion and inversion and the knee held extended

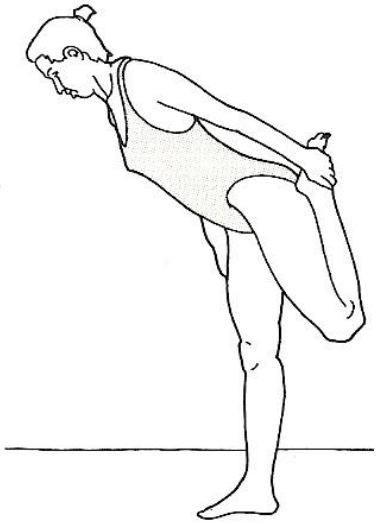


Fig. 11.4 'Quadriceps' in standing

Fig. 11.2 The SLR in an open doorway

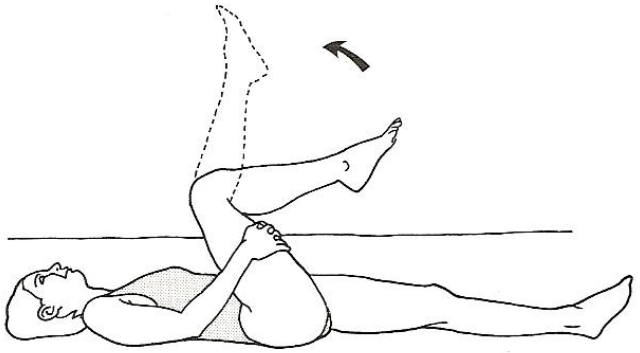
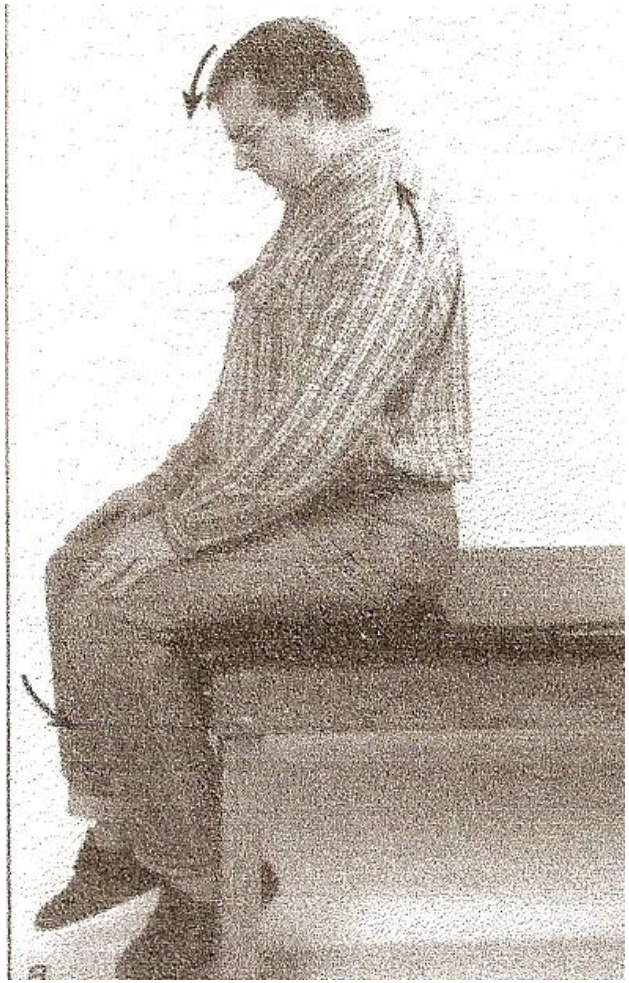
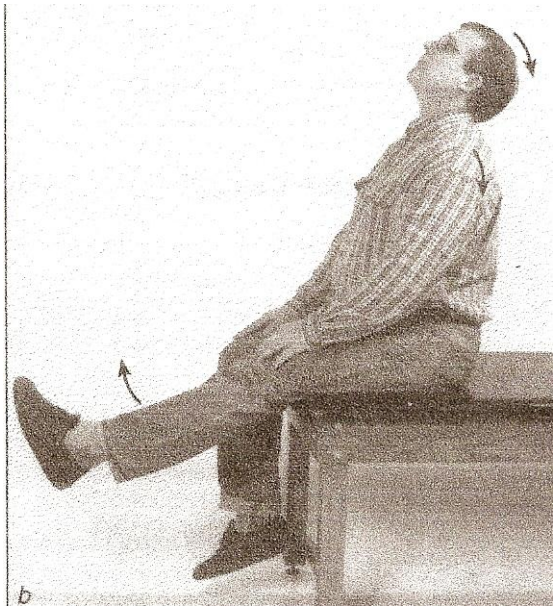


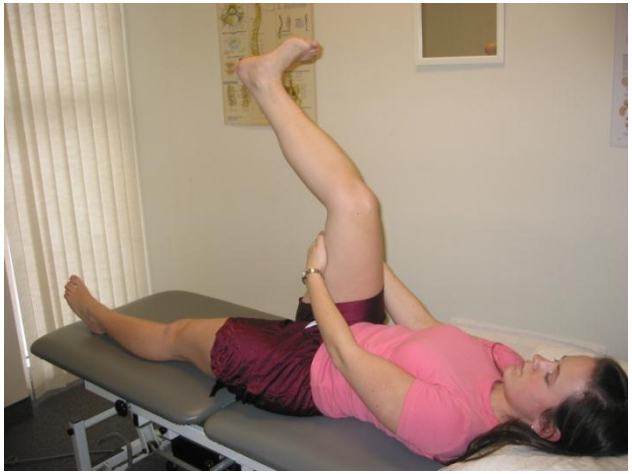
Fig. 11.1 In hip flexion, active extension of the knee for a moderately irritable lumbar spine

Sliders





Low Irritability Exercises: Tibial, Peroneal nerves



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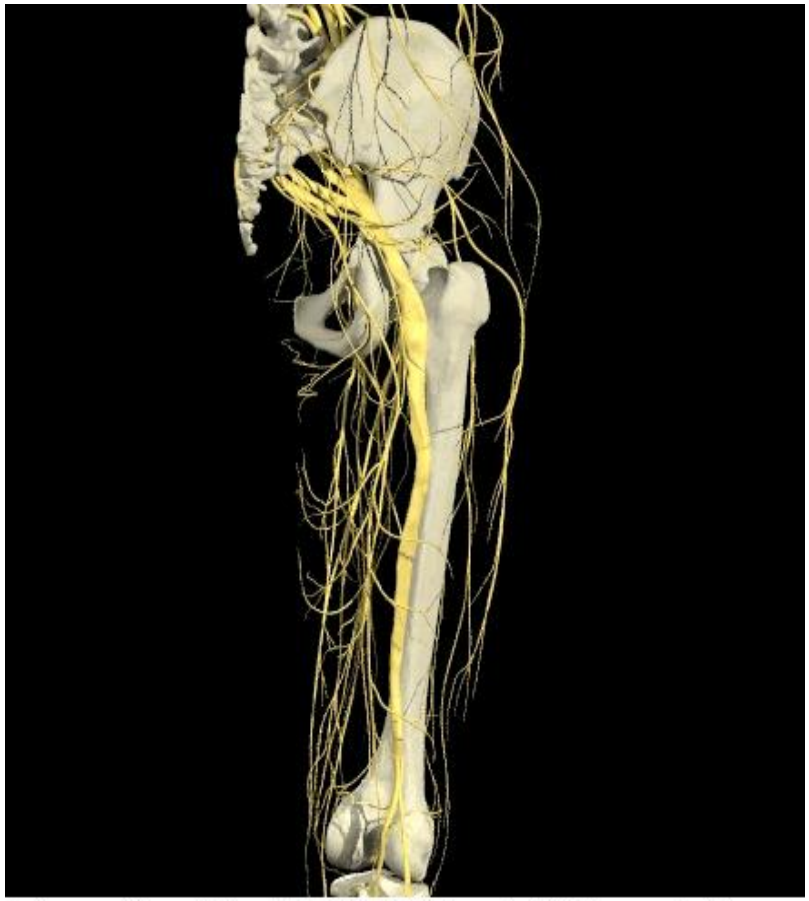
Problem Solving: Interfaces for

- Sciatic nerve
- Femoral nerve and branches
- Peroneal and Sural nerve
- Tibial nerve and branches

Sciatic Nerve & Branches



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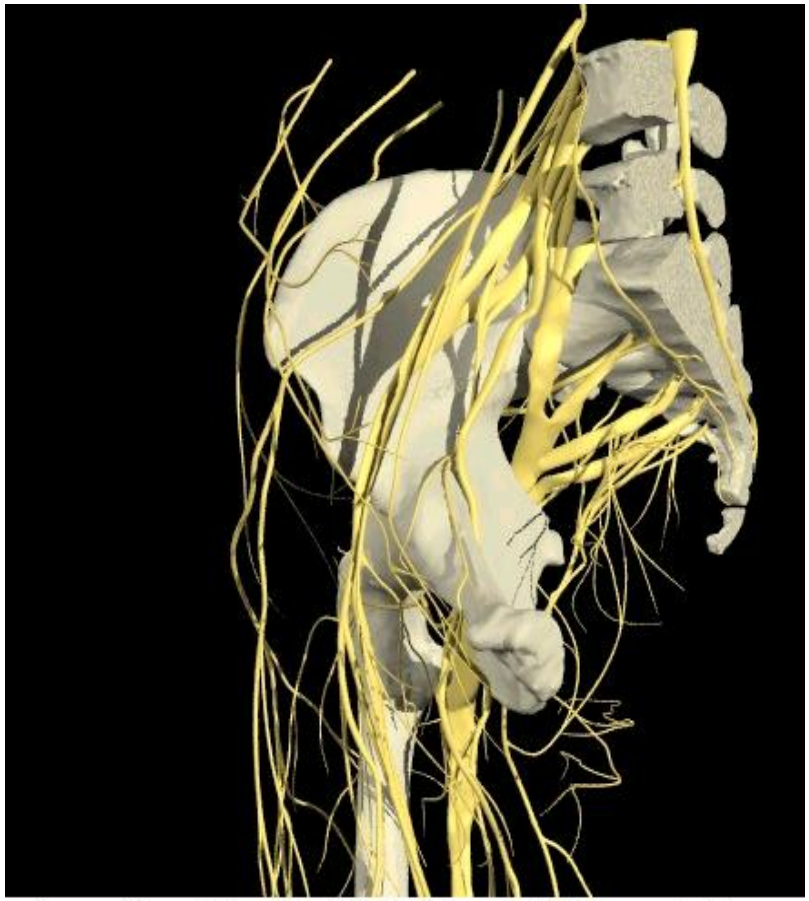
Interactive Foot and Ankle 2 © 2001 Primal Pictures Ltd.

Femoral Nerve & Branches



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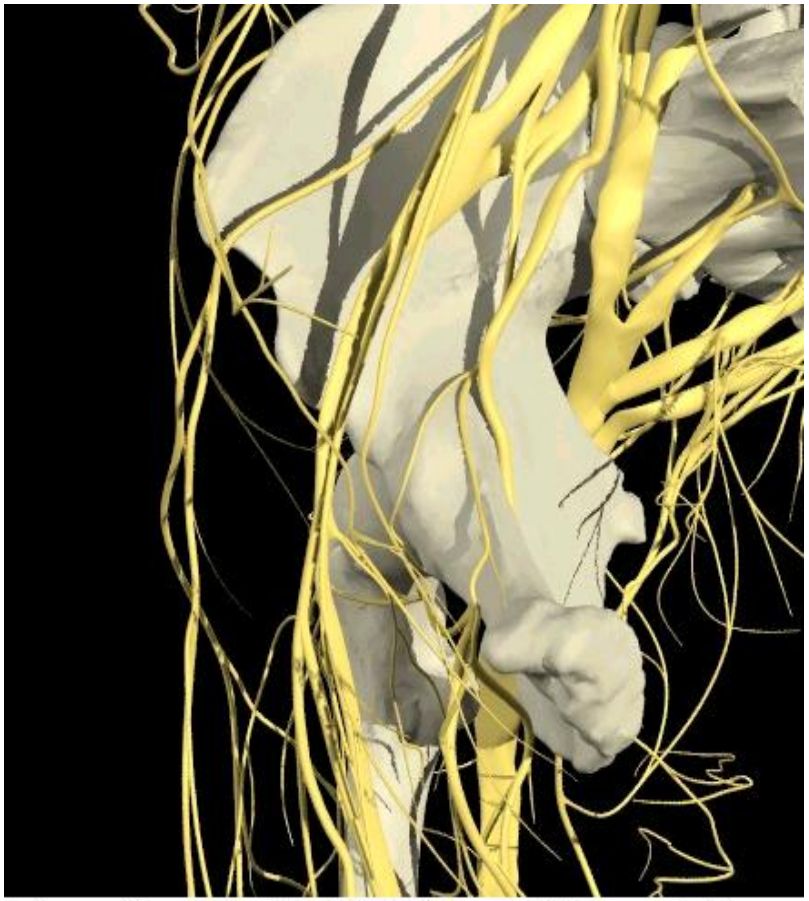

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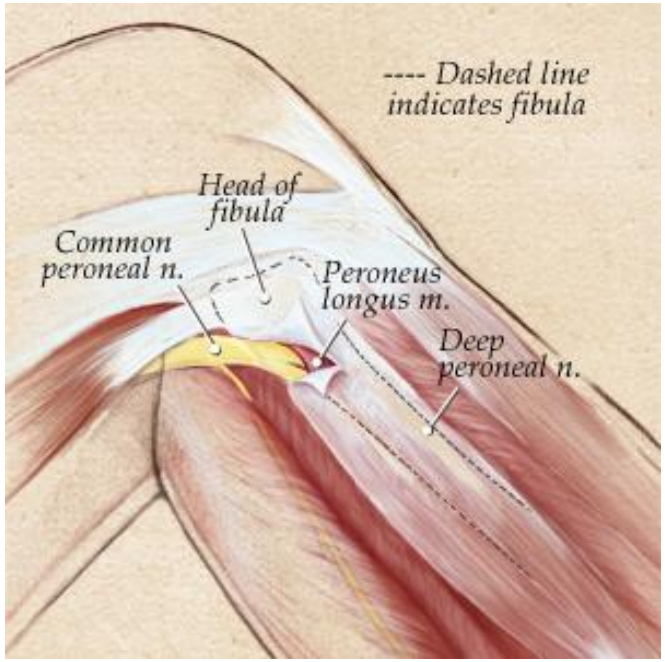
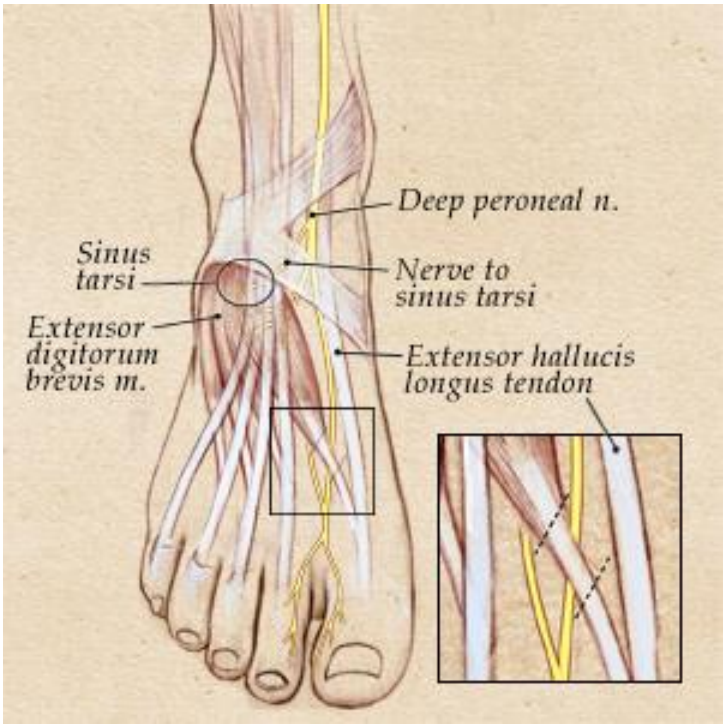
Deep Peroneal Nerve





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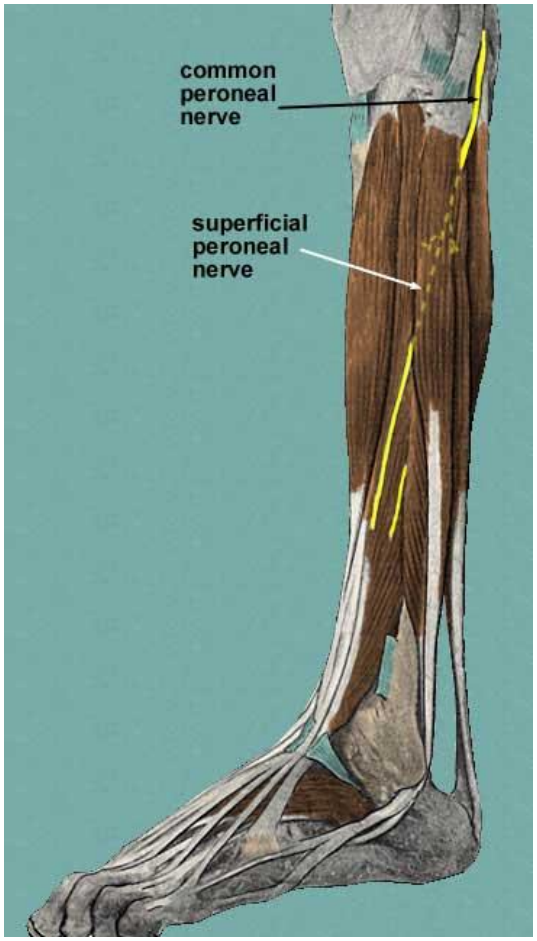
Superficial Peroneal Nerve



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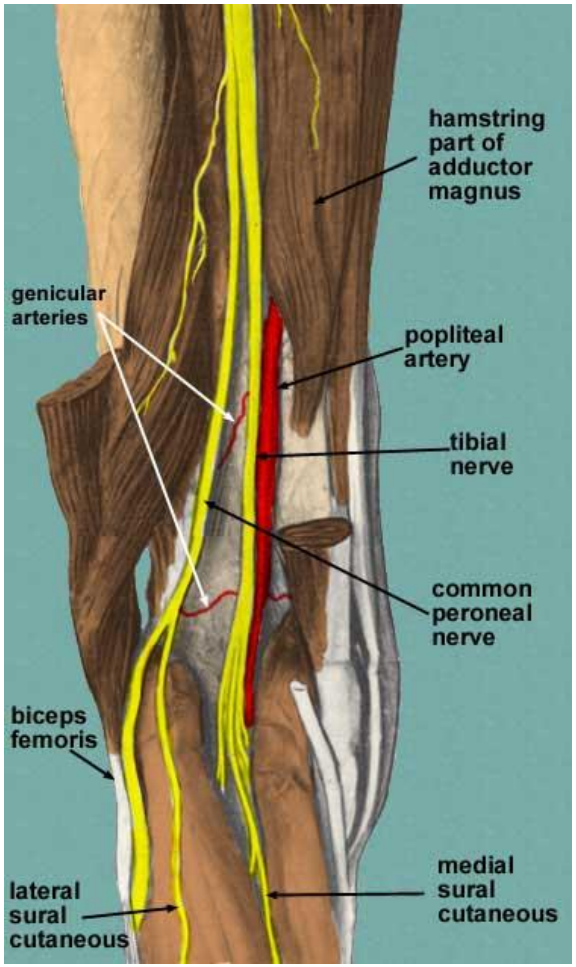
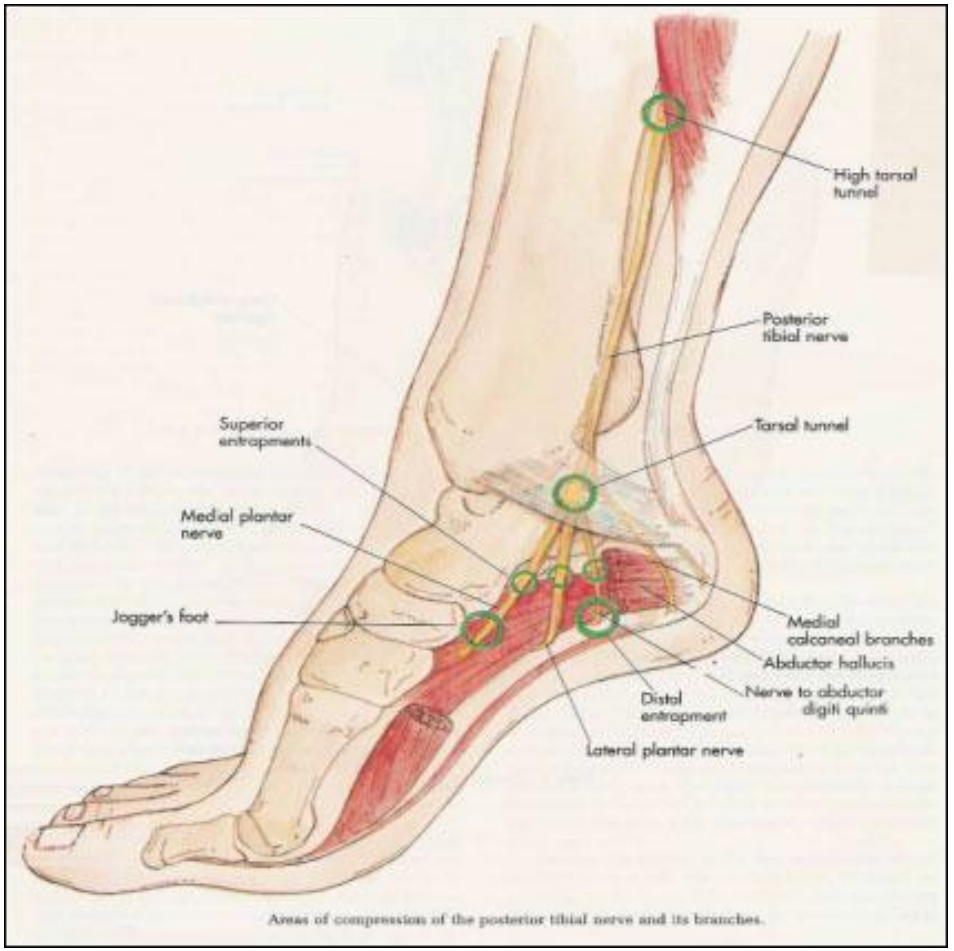
Tibial Nerve and Branches

- 



Problem Solving

- Neurodynamic Tests for sliding dysfunction & tension dysfunction for listed nerves
- Nerve Palpation
- Interface dysfunction
- Treatment for acute & / or irritable problem
- Progress treatment to techniques for low levels of pain and irritability
- Home program

References

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