(PBL) Upper & Lower Extremity Musculoskeletal Exam Techniques: Evidence-Based Treatment

Anthony Beutler, MD, FAAFP

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Dr. Beutler practices family medicine and comprehensive primary care sports medicine for the U.S. Air Force, caring for active-duty service members, retirees, and their families in the Washington, DC, area. He is an award-winning educator and teacher, and he and his team recently developed and implemented a new musculoskeletal curriculum for USU's medical school. The author of numerous articles and a textbook, Dr. Beutler has lectured throughout the world. One of his favorite activities is helping family physicians make their musculoskeletal practices more rewarding and profitable.

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Learning Objectives

1. Practice applying new knowledge and skills gained from Upper & Lower Extremity Musculoskeletal Exam Techniques sessions, through collaborative learning with peers and expert faculty.

2. Identify strategies that foster optimal management of musculoskeletal injuries, within the context of professional practice.

3. Formulate an action plan to implement practice changes, aimed at improving patient care.

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Associated Session

- Upper Extremity Musculoskeletal Exam Techniques: Evidence-Based Treatment
- Lower Extremity Musculoskeletal Exam Techniques: Evidence-Based Treatment

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Musculoskeletal Injury PBL

- Case 1
- Case 2
- Questions

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Case #2 - Chief Complaint

- “My knees hurt when I run...”

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History of Present Illness

"Laura"

- 28 yo F c/o B knee pain during/after runs
- Pain is sharp when running and a "dull ache" after activity
- No trauma
- Has a 60 min drive to work and increased pain while driving and feels like she needs to straighten her knee out
- Hurst going up and down stairs

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Past Medical History

- No significant PMHx
- G1P1
  - First baby via C-section 1 year ago
- No medications

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Social History

- Paralegal
  - works 30 hours/week now after baby
- Started running regularly 6 weeks ago to get in shape and loose weight
- Never tobacco,1-2 glasses wine/wk, No drugs (to include OTCs)

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Review of Systems

- No swelling, locking of knees
- No other joint complaints
- No unusual fatigue
- No nausea, vomiting, night pain
- She gained 42 lbs with pregnancy and has lost 22 lbs since delivery

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What is your differential diagnosis for Laura's knee pain?

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Differential Diagnosis

- Patellofemoral pain syndrome/Anterior knee pain
- Patellar tendonitis/tendinopathy
- Pes anserine bursitis
- Iliotibial band syndrome
- Chondral Injury → Osteoarthritis
- Inflammatory Arthropathies
-

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- What physical exam findings and tests will aid in narrowing your DDx and creating a treatment plan?

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Physical Examination

- BMI 29
- Valgus (Knock kneed) Lower Extremity alignment
- B knees no effusion, erythema, no gross atrophy
- No joint line TTP
- + retropatellar TTP
- + increased pain with patellar shrug/Clarke's
- No ligamentous laxity/instability to include patella
- Negative McMurray but some pain under kneecap with Thessaly

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- Do you need to order x-rays?
  - Yes or No
- If you said yes, which x-rays and what are you looking for?
- Do you need to order an MRI?

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- What is Laura's likely diagnosis?
- So what is the "Victim" in this case? What anatomic structure is "being injured/victimized?"

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Assessment

Victim: Patellofemoral Pain Syndrome (PFPS)

– What is PFPS?

PFPS is defined as anterior knee pain in the absence of any other pathologic condition

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- What are the three major categories of biomechanical culprits that usually cause patellofemoral pain?

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Assessment

Victim: Patellofemoral Pain Syndrome
- That's the easy part

Find the Culprit – Where you Earn the $$
- Assess 3 major biomechanical culprits:
  - Muscular weakness
  - Muscular tightness
  - Skeletal malalignment

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- Discuss the relative importance of each of the following treatment recommendations for Laura:
  - Rest, ice, compression, and elevation BID
  - Motrin 800mg PO TID for 28 days
  - Knee brace/taping
  - Stop running and switch to elliptical trainer
  - Get new running shoes
  - Hamstring, quadriceps and calf stretching
  - Quadriceps and Core strengthening program

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Plan

- Attack most likely Culprit:
  - Muscular strength
- Quadriceps strengthening program
  - Bike or eliptical (forward & backward)
- Core strengthening program
  - PT referral or Yoga, Pilates, Strength Coach etc
- Load Management

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http://hprc-online.org/physical-fitness/rehab

an open source rehab program

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Musculoskeletal Injury PBL

- Case 1
- Case 2
- Questions

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Chief Complaint

- “My Shoulder Hurts...”

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History of Present Illness

"Bob"

- 48 yo M c/o R shoulder pain
- Sharp pain with overhead movements; "dull ache" after activity; diffuse lateral deltoid location
- No acute trauma
- Started 4 weeks ago and getting worse
- Doing a lot of home improvement projects recently, but no idea how he injured it

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Past Medical History

- PMHx: HTN
- Remote PSx: Appendectomy, no shoulder/neck/ortho surgeries

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Social History

- Recently retired military
  - Now working as govt contractor (desk job)
  - But real passion is woodworking/carpentry
- Enjoys sports, plays rec softball, occasional basketball when he gets the chance
- Remote tobacco, quit 15 years ago, 2-3 beers per weekend, No drugs

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- What is your differential diagnosis of likely causes for Bob's shoulder pain?

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Differential Diagnosis

- Rotator cuff tendinopathy
- Degenerative rotator cuff tear
- Subacromial bursitis

- Biceps tendinopathy
- Degenerative labral tear
- Early adhesive capsulitis

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- What physical exam tests will be critical in narrowing or correctly ordering your DDx?

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Physical Examination

- WN, WN male, NAD

- Normal inspection, no atrophy/deformity
- Painful arc of motion, but full AROM
- No TTP clavicle or AC joint
- 4/5 full can and external resistance strength
- No Ext or Int Rotation lag

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- Do you need to order xrays?
  - Yes or No
- Do you need to order an MRI?
  - Yes or No

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- What is Bob's likely diagnosis?
- So what is the "Victim" in this case? What anatomic structure is "being injured/victimized?"

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- What is the likely culprit causing Bob's rotator cuff pain?

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Assessment

Victim: Rotator Cuff

– That's the easy part

Find the Culprit – Where you Earn the $$

- Rotator Cuff
  – When victim = culprit, then we have a suicide!

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- Discuss the relative importance of each of the following treatment recommendations for Bob:
  – Motrin 800mg PO TID for 28 days
  – Rest, ice, compression, and elevation BID
  – Sling for comfort
  – Subacromial steroid injection
  – Rotator cuff and scapular stabilizer strengthening program
  – Acupuncture
  – Massage therapy

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Returning to Differential Diagnosis – What Else Could This Be???

- Rotator cuff tendinopathy – Rot cuff strengthening
- Degenerative rotator cuff tear - ??
- Subacromial bursitis

- Biceps tendinopathy - ??
- Degenerative labral tear - ??
- Early adhesive capsulitis

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Plan

- Attack most likely Culprit:
  - Rotator cuff and scapular stabilizer strength
- Rotator cuff strengthening program
  - PT referral or Strength Coach or YouTube
- Consider Injection/Acupuncture/Pain relief

- Do NOT order an MRI
  - unless you are considering surgery

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http://hprc-online.org/physical-fitness/rehab

an open source rehab program

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Practice Recommendations

- Strengthening of the core & kinetic chain is key for rehab/prevention of overuse injury
- Most patients with overuse injury need good rehabilitation program, not surgery

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Questions

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GET ACTIVE!

It's easy. Here's how...

√ Check with your doctor when starting to run. This is especially important if you or your family have any heart problems, high blood pressure, high cholesterol, breathing problems, diabetes, or if you are overweight or smoke.

√ Get well-fitting, well-cushioned running or cross-training shoes. If you run less than 10 miles a week and don't have a history of sports injuries, most entry-level running shoes will work for you. A specialty shoe store with knowledgeable salespeople can help you find a shoe made for your needs. Or send a self-addressed, stamped envelope to American Running to get our Running Shoe Database Questionnaire.

√ Wear comfortable, loose-fitting clothes. If the temperature is cool, dress in layers to strip down as you warm up.

√ Ask a friend to join you. When getting started, it sometimes helps to find a friend to work out with. You'll motivate each other.

√ Schedule time for your workouts — mark it on your calendar. If you set aside a definite time to exercise, you'll be more likely to keep the commitment.

√ Keep a log. You'll be surprised and proud of how much you are doing. It also makes it easier to track your progress.

Easy 12-Week Walk/Run Program!

	DAY ONE	DAY TWO	DAY THREE	DAY FOUR	DAY FIVE	DAY SIX	DAY SEVEN
1	Walk 15 min. Vary your pace. Try not to stop.	Walk 5 min. Run 1. (Repeat for a total of 17 min.) Walk 5.	Walk 15 min. Vary your pace. Try not to stop.	Walk 5 min. Run 1. (Repeat for a total of 17 min.) Walk 5.	Walk 15 min. Vary your pace. Try not to stop.	Walk 5 min. Run 1. (Repeat for a total of 17 min.) Walk 5.	Rest!
2	Walk 15 min. Run 1. Walk 2.	Walk 5 min. Run 3. (Repeat for a total of 21 min.) Walk 5.	Walk 15 min. Run 1. Walk 2.	Walk 5 min. Run 3. (Repeat for a total of 21 min.) Walk 5.	Walk 15 min. Run 1. Walk 2.	Walk 5 min. Run 3. (Repeat for a total of 21 min.) Walk 5.	Rest!
3	Walk 15 min. Run 1. Walk 2.	Walk 6 min. Run 4. (Repeat for a total of 26 min.) Walk 5.	Walk 15 min. Run 1. Walk 2.	Walk 6 min. Run 4. (Repeat for a total of 26 min.) Walk 5.	Walk 15 min. Run 1. Walk 2.	Walk 6 min. Run 4. (Repeat for a total of 26 min.) Walk 5.	Rest!
4	Walk 15 min. Run 2. Walk 4.	Walk 3 min. Run 2. (Repeat for a total of 30 min.) Walk 5.	Walk 15 min. Run 2. Walk 4.	Walk 3 min. Run 2. (Repeat for a total of 30 min.) Walk 5.	Walk 15 min. Run 2. Walk 4.	Walk 3 min. Run 2. (Repeat for a total of 30 min.) Walk 5.	Rest!
5	Walk 15 min. Run 2. Walk 4.	Walk 5 min. Run 5. (Repeat for a total of 35 min.) Walk 5.	Walk 15 min. Run 2. Walk 4.	Walk 5 min. Run 5. (Repeat for a total of 35 min.) Walk 5.	Walk 15 min. Run 2. Walk 4.	Walk 5 min. Run 5. (Repeat for a total of 35 min.) Walk 5.	Rest!
6	Walk 30 min.	Walk 4 min. Run 6. (Repeat twice.) Walk 5.	Walk 30 min.	Walk 4 min. Run 6. (Repeat twice.) Walk 5.	Walk 30 min.	Walk 4 min. Run 6. (Repeat twice.) Walk 5.	Rest!
7	Walk 30 min.	Walk 4 min. Run 6. (Repeat twice.) Walk 5.	Walk 5 min. Run 10. Walk 5.	Walk 4 min. Run 6. (Repeat twice.) Walk 5.	Walk 5 min. Run 10. Walk 5.	Walk 4 min. Run 6. (Repeat twice.) Walk 5.	Rest!
8	Walk 30 min.	Walk 2 min. Run 1. (Repeat 9 times.) Walk 5.	Walk 5 min. Run 15. Walk 5.	Walk 2 min. Run 1. (Repeat 9 times.) Walk 5.	Walk 5 min. Run 15. Walk 5.	Walk 2 min. Run 1. (Repeat 9 times.) Walk 5.	Rest!
9	Walk 30 min.	Walk 1 min. Run 30 sec. (Repeat 20 times.) Walk 5.	Walk 5 min. Run 20. Walk 5.	Walk 1 min. Run 30 sec. (Repeat 20 times.) Walk 5.	Walk 5 min. Run 20. Walk 5.	Walk 1 min. Run 30 sec. (Repeat 20 times.) Walk 5.	Rest!
10	Walk 5 min. Run 20. Walk 5.	Walk 15 min.	Walk 5 min. Run 20. Walk 5.	Walk 15 min.	Walk 5 min. Run 20. Walk 5.	Walk 15 min.	Rest!
11	Walk 5 min. Run 25. Walk 5.	Walk 15 min.	Walk 5 min. Run 25. Walk 5.	Walk 15 min.	Walk 5 min. Run 25. Walk 5.	Walk 15 min.	Rest!
12	Walk 5 min. Run 30. Walk 5.	Walk 15 min.	Walk 5 min. Run 30. Walk 5.	Walk 15 min.	Walk 5 min. Run 30. Walk 5.	Walk 15 min.	Rest!

GET FIT!

Warm up for five to 10 minutes before exercising by doing light activity (so that your heart beats faster, your breathing gets heavier, and you begin to get sweaty).

Many athletes stretch their muscles after warming up. For walking or running, stretch the front of your thighs (quadriceps), back of your thighs (hamstrings), and back of your lower legs (calves). It may feel good to also stretch your back and hips. Hold each stretch, with no bouncing, for about 20 to 30 seconds.

Cool down slowly after your workout. Your heart should beat slower while your breathing gets easier. It is important to stretch the muscles you used in running after exercise to prevent your muscles from tightening up.

Don't become dehydrated. Drink six to eight glasses of fluids (water, sports drinks with a 6% to 7% carbohydrate concentration, or diluted fruit juices) throughout the day. About 15 to 30 minutes before exercise, drink four to eight ounces of fluid. During exercise, drink four to eight ounces of fluid at 15 minute intervals. After exercise, drink at least eight to 16 ounces of fluid. To find out if you're drinking enough, check your urine. It should be clear throughout most of the day.

Listen to your body. If you are sore, skip an exercise session. If you are still sore after resting, call American Running for advice or for the name of a sports medicine professional in your neighborhood.

Join the American Running Association!

Each month you'll receive "Running & FitNews," a newsletter crammed with sensible, informative and up-to-date sports information that will keep you on the right track. Plus, you'll receive free medical information, discounts, personalized training schedules and more! For information about becoming an American Running member, call 1-800-776-2732 or write to the American Running Association, 4405 East West Highway, Suite 405, Bethesda, MD 20814. FAX 301-913-9520, e-mail: run@americanrunning.org, or visit: www.americanrunning.org.

RUN!

Your Way to Fitness

Do you want to improve your health and get fit? Try running! People who are active not only feel better and have more energy than their couch-potato friends, but are more likely to be healthier.

Running reduces your risk of developing heart disease, high blood pressure, diabetes, several types of cancer, and even the common cold. It improves your cardiorespiratory health, making it easier to do everyday tasks such as climbing stairs or keeping up with an active child. And if it's weight you're worried about, running can burn that excess body fat and create a leaner you!

The Role of Eccentric Exercise in Treating Tendinosis

Background

Alfredson first reported success using heavy-load eccentric training to treat chronic Achilles tendinosis in 1998. From 1998 to 2002 only five articles appeared in the scientific literature regarding eccentric training. But this past year (2006), thirteen articles were published describing eccentric exercise treatment for varied types of tendinosis. As of July 1, at least 23 such articles had been published in 2007. Given this information explosion, what do we know about eccentric exercise and its role in the treatment of chronic tendinopathies?

What is Eccentric Exercise?

The term eccentric exercise refers to muscular activation during muscle lengthening (e.g. the biceps is activated eccentrically when a dumbbell is slowly lowered from the shoulder to the waist). For decades conventional wisdom held that tendinosis patients should scrupulously avoid eccentric exercise for fear of rupturing the diseased tendon. However, as proven by Alfredson and others from 1985 to 2004, eccentric exercise seems to result in normalization of peritendinous blood flow, improvement in tendon histology and morphology, and most importantly, in decreased clinical tendinosis symptoms.

Mechanism of Therapeutic Action

The exact mechanisms by which eccentric exercise exerts its beneficial effects are incompletely understood. Tendinosis is a non-inflamatory, degenerative tendon condition. Eccentric exercise appears to decrease the characteristic neovascularization found in degenerative tendons. It is not known whether eccentric exercise reduces neovascularization directly by mechanically destroying neovessels or indirectly through alterations in vascular growth factors. It is also possible that eccentric exercise may directly stimulate collagen synthesis pathways.

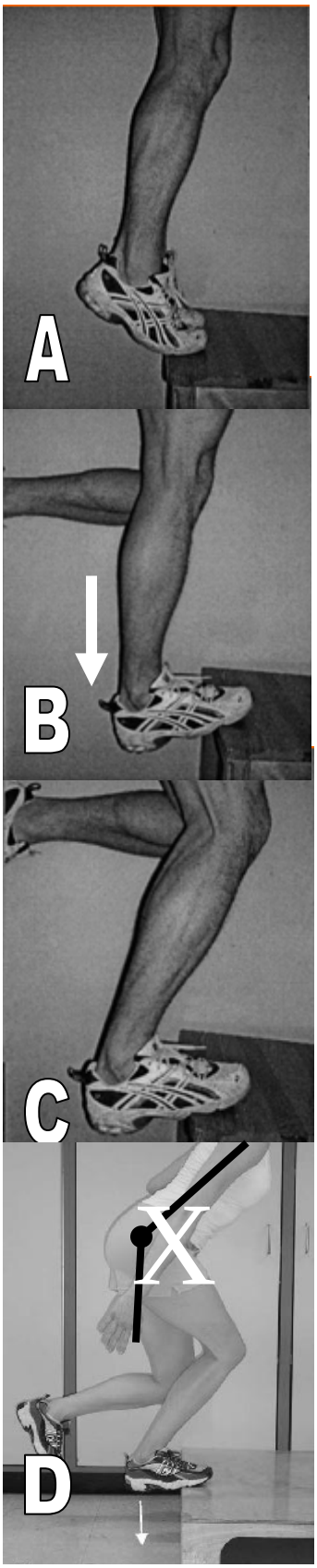
What does the Evidence show?

Decline eccentric squats
for patellar tendinopathy

Many questions still exist regarding optimal frequency, duration, and loading of eccentric exercise. Also unclear is the question of whether athletes can continue to train and compete while undergoing eccentric rehabilitation for symptomatic tendinosis. But what we do know is that strong clinical evidence shows that eccentric exercise treatment is highly effective for Achilles tendinosis and patellar tendinosis (jumper's knee). Moderate evidence supports its efficacy in tendinosis at the elbow (tennis elbow) and smaller studies show benefit in other wrist tendinopathies.

A patient education handout demonstrating eccentric exercise for Achilles tendinosis is attached.

Heel Drop Exercises for Achilles Tendinopathy



Exercise 1:

1. Stand on the edge of a step, in good shoes with heels off the edge of the step as shown.

2. Using both legs, push up onto your toes (Figure A).

3. Lift your left foot up so that you standing on the toes of your right foot only. Keep your right knee straight.

4. Using only your right leg, slowly lower your heel towards the ground (Figure B). Lower yourself in a controlled fashion.

5. Replace your left foot onto the step. Push up with both legs to return to starting position (Figure A). Perform 15 repetitions with the right leg.

6. Repeat the above using the left leg. In all you should perform 2 sets of 15 repetitions for both the right and left legs.

Exercise 2:

1. Stand on the step again in shoes, up on your toes (Figure A), and lift your left foot up.

2. Lower your heel to the ground slowly using only your right leg, but this time keeping your right knee bent (Figure C)

3. Perform 15 repetitions with the right leg, then repeat for the left leg. Again you should perform 2 sets of 15 repetitions for both right and legs.

Tips:

- Maintain good alignment, keeping knees, hips, and ankles in alignment. Avoid excessive trunk flexion (Figure D).

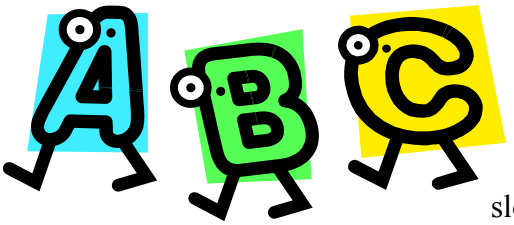
- Your legs will be sore. This is actually good and part of the healing process. In a couple of weeks you will notice that your legs are not sore anymore after the exercises. When this happens, you'll want to increase the resistance (perform on a weight sled in the gym, put weights in a backpack, etc) to make your legs sore again.

- During the first 4-6 weeks of exercises, you should not be running or playing sports. During the last 4-6 weeks your doctor may allow you to return to some of these activities.

Any questions or concerns, please call: _____

REHABILITATION FOR ANKLE SPRAIN

STEP 1: IMPROVING RANGE OF MOTION - TOE ALPHABET



While sitting in a chair, "write" each letter of the alphabet from A to Z on the floor with your toes. Move only your ankle--Try not to move your knee and hip. The letters will start out large and sloppy, but will get smaller and neater as your ankle improves. You can start these exercises immediately after being diagnosed with an ankle sprain.

STEP 2: REGAINING STRENGTH - TOWEL DRAG EXERCISES

Towel drag exercises are decidedly low-tech, but very effective for strengthening ankle and foot muscles. Start these exercises as soon as you can move your ankle from side to side with only minor discomfort.

Fig. 1 Towel Drag (Side to Side)

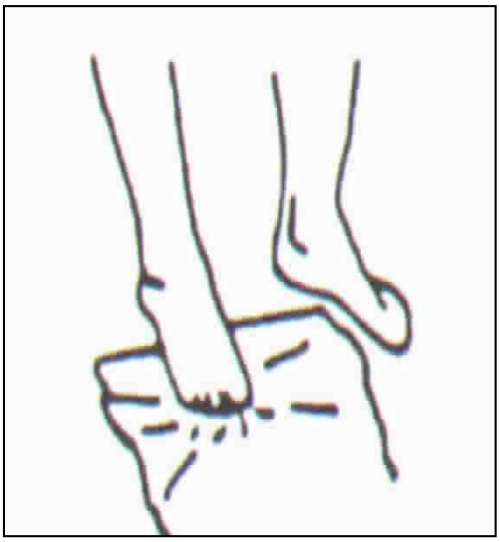


Fig. 2 Towel Crunch (Front to Back)

1. Start with towel spread to maximum length, but folded to 4-6" wide.
2. Place towel medial to bare foot on wood, tile, or other smooth surface.
3. Keeping heel on the ground, drag towel from medial to lateral, until entire towel is bunched lateral to foot (See Fig. 1 above).
4. Re-fold towel and place lateral to foot.
5. Keep heel on the ground while using toes to drag towel lateral to medial, until entire towel is bunched medial to foot.
6. Re-fold towel and place anterior to foot.
7. Lift heel off the ground and use toes to curl towel back towards heel, until entire towel bunched under arch of foot (See Fig. 2 above)
8. Perform same 3 towel drags with opposite foot.
9. Repeat each set of drags 10 times with each foot, once or twice daily.
10. A can of soup can be placed on top of the towel and dragged with the towel for added resistance.
11. Continue exercises until you can do 3 sets of 10 with 1 or 2 soup cans.

STEP 3: RE-TRAINING BALANCE – SINGLE LEG BALANCE

When your ankle is injured, it looses the ability to sense its position in space. Regaining this sense of position or "proprioception" is essential to preventing re-injury. Begin these exercises as soon as you can stand on one leg with minimal discomfort.

1. Practice standing on one leg, barefoot on a hard floor. Do several repetitions at least twice per day on each foot. Some patients find the best time to do this is while they are brushing their teeth.
2. After you can stand on one foot and feel somewhat balanced, try standing on one foot with your eyes closed. Make sure you have something or someone to grab on to. It's harder than it looks!
3. When you can stand for ~20 seconds on your injured ankle with your eyes closed, make the task harder. Examples:
    a. Try brushing your teeth while standing on one foot, eyes closed.
    b. Stand on a pillow instead of the hard ground.
    c. Stand on one leg and play catch with someone. Have your partner throw the ball so that you have to bend to catch it.
4. Continue the balancing exercises until you could play catch with a young child while standing one your injured ankle.

OTHER NOTES:

Remember that simply resting your ankle will not help it get strong again. Your ankle needs gentle exercise and activity to help it heal.

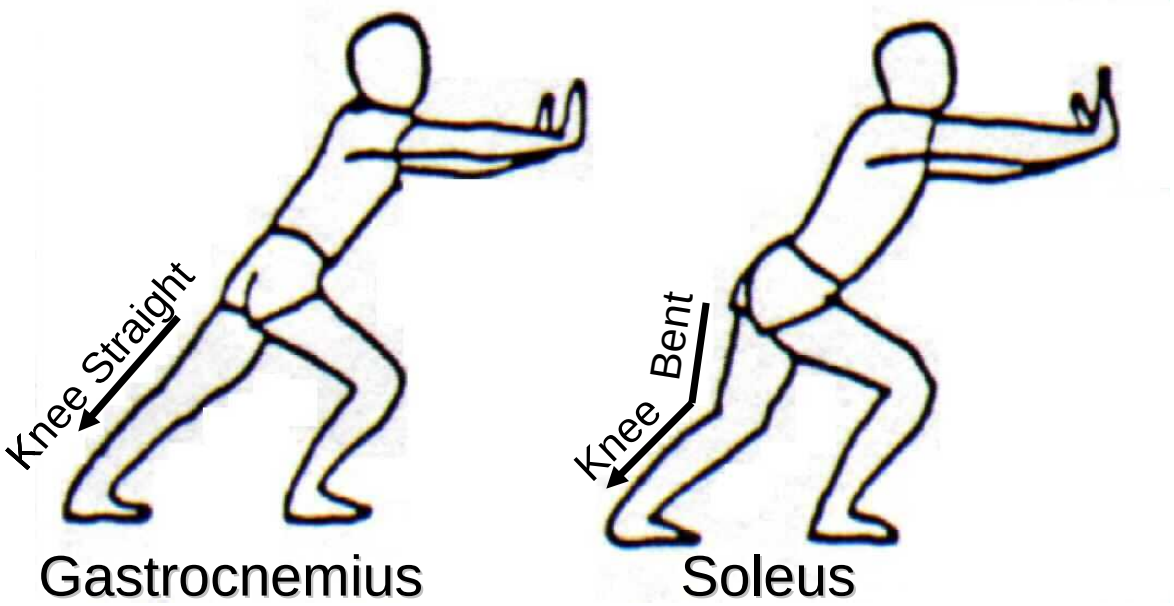
Most ankle sprains take 4-6 weeks to feel better. If your ankle is still hurting after 6 weeks of treatment, please make a return appointment to see your doctor.

If you were given a brace, make sure and ask your doctor or therapist how long you should wear the brace and for what specific activities.

HEEL CORD STRETCHING

Stretching the gastrocnemius and soleus is a therapeutic key in the treatment of many types of heel pain. The following box illustrates the recommended routine.

Stretching the heel cord involves stretching two separate muscles: the gastrocnemius and the soleus. Both muscles should be stretched individually for best results.



1. Place leg to be stretched behind the other and lean forward onto wall, keeping back knee straight.
2. Continue to lean forward keeping knee straight and heel on the ground until pull is felt in upper calf (gastrocnemius)
3. Hold for 30 seconds *(That's a full commercial! That's a LONG time!)* Muscle begins to lengthen after 20 seconds of stretching, so final 10 seconds are the most essential.
4. Next lean forward again, but bend knee on back leg, still keeping heel on the ground. Often helpful to visualize trying to "kneel while keeping your heel on the ground."
5. Continue to kneel and lean until pull felt in lower calf (soleus)
6. Hold for 30 seconds
7. Repeat on opposite leg
8. Stretch each leg 3 times in one stretching session
9. To improve heel cord flexibility, recommend 3 stretching sessions per day. To maintain flexibility, one session per day is adequate.

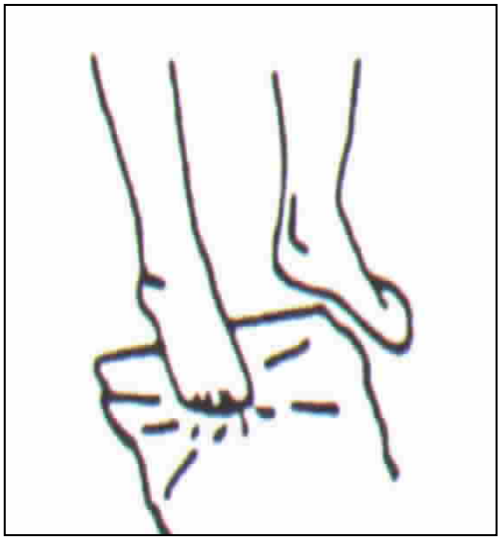
Plantar Fascia Stretch –
Hold stretch for 30 seconds
Stretch each foot, 3 times

Perform Stretch 2-3 times/day

TOWEL DRAG EXERCISES

Towel drag exercises are decidedly low-tech, but very effective for strengthening ankle and foot muscles.

Fig. 1 Towel Drag (Side to Side)



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