Prevention of RUNNING INJURIES Workshop

pure form physio

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Workshop Outline:

1. Introduction: Prevention of Running Injuries

I have developed this manual as a means to help runners to do what they (hopefully) love to do: run. The motivation to put this information in this format stems from a number of things including my life long love of running, my own battles and victories with nagging injuries over the years, and my clinical experience in treating many runners. This information is primarily intended to help prevent injuries and secondarily to improve your running technique. It is not a coaching manual. With the advent of the running clinics based out of local shoe stores and community centres, there are many good people out there setting runners up on good running programs. I think of this information as an additional resource to these programs, hopefully one that will help you get the most out of those programs. I have based the information on the following sources: the scientific evidence from peer reviewed articles, the opinions and advice of experts in sports medicine, physiotherapy and coaching, my clinical experience in treating injured runners and my own experience as a runner and triathlete. The therapists at Pure Form Physio taught many of these exercises to injured athletes when we were the official physiotherapy service suppliers for the Junior National Canadian Track and Field Championships in 2013 and 2014. However, this information is designed for runners of all ability levels. I hope you enjoy the manual and find the information helpful and effective. If you feel you need assistance with any of these exercises or are interested in learning more, contact us at Pure Form Physiotherapy (www.pureformphysio.ca). Run on!

2. Core stability: Recruitment of the Transversus Abdominis

The term core stability has become very popular in the related fields of fitness and rehabilitation in the last decade or so. It is with good reason: core stability is vital to good athletic performance and to prevention of non –traumatic musculo-skeletal injuries (e.g. low back pain, hip and groin pain). Definitions abound, but

generally core stability means that the postural stabilizing muscles are able to effectively support the pelvis and trunk during athletic movements such as running. Adequate core stability means that there will not be excessive and potentially harmful movement in the joints of the low back, pelvis and hips. The excessive movements can lead to injury and reduced performance. An example would be that of a runner with poor core stability that has excessive side-to-side sway in their body as they run. This can lead to a host of problems such as ilio-tibial band (ITB) friction syndrome, which is a painful over-use injury felt at the outer knee and thigh. Researchers in the area of core stability have divided the core into the inner core and the outer core. The inner core muscles include the diaphragm (for breathing), the pelvic floor (the muscles that allow you to control bodily functions), transversus abdominis (the deepest abdominal muscle), and a back muscle named multifidus. Conversely, we can generalize and say that the outer unit muscles are made up of all of the other trunk muscles involved in maintaining spinal posture.

The following technique can be used to learn how to isolate the core muscles. It is important to not overly activate (turn on) these muscles. When a person does over -activate, we call it “bracing”. The problem with bracing is that it happens at the expense of flexibility and comfortable breathing. That is a big price to pay when you want to run a 10 km or a marathon! Try this: take a big breath in and then tighten your abdominal and pelvic floor muscles as tightly as you can. That is bracing. It is uncomfortable, tiring and would make running well impossible. Bracing is not good for running or any endurance sport. In contrast, isolation of the core (gentle activation) is key in the early stages of core stability training and means that you are able to activate the core muscles without activating any other muscles.

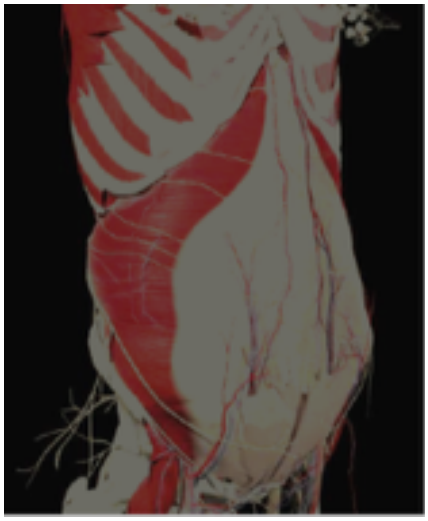


FIGURE 1. TRANSVERSUS ABDOMINIS

Isolation of Transversus Abdominis

Transversus abdominis wraps around the abdomen like a corset or a thick belt. See the anatomical diagram (Figure 1). The function of the transversus abdominis is to stabilize the low back and pelvis as you prepare to move. It will continue to be active during running or any other movement. Isolating the core means being able to activate your core muscles without over-activating any other muscles in your body. The goal is to be able to isolate the core muscles (inner unit) and then be able to activate the outer unit and perform functional activities, such as running.

Technique:

- Lie on your back with your knees bent (Figure 2)
- Different cues work for different people, but cues we frequently use are :
    - elevate your pelvic floor muscles as if you are trying to stop from urinating
    - imagine a line connecting your two hip bones at the front, now shorten that line

- Breath in and on the breath out gently contract the inner unit using one of the images (above) . Do not move your low back or pelvis as you do this.
- Under your fingers you should feel a light, deep tension develop in the muscles of your abdomen.
- Maintain the contraction for 10 seconds, rest and repeat 10-20 times
- Common mistakes: holding breath, bulging out abdomen muscles (too much effort), performing a pelvic tilt by pushing low back into ground.

FIGURE 2. TA ACTIVATION

3. Strengthening the core

Now that you know how to isolate, it is necessary to be able to keep the core on as you begin to move your limbs. These exercises are intended to teach you the coordination required to gently activate your core as you run. The following exercises progress from easier to harder. They all have a focus on lateral pelvic stability, which is integral for proper dynamic alignment of the low back, pelvis and lower limb as you run. Once you have the basics of activation of the core, you are only limited by your imagination in what exercises you can do to train the core. Exercise balls, wobble boards, and resistance bands can all be used to progress your core training. Try each exercise for 3 sets of 12-15 repetitions.

A. Four point hip extension (Figure 3)

- In four-point kneeling, activate your core
- Maintaining your spinal alignment, slowly extend one leg behind you and then return to your start position
- Repeat with the other leg and continue alternating from side to side

FIGURE 3. FOUR POINT HIP EXTENSION

B. Single Leg step down (Figure 4 and 5)

- Gluteus medius and the VMO (inner quadriceps) are strengthened in this exercise, which is vital to reducing the risk of all lower limb running related injuries
- stand on the edge of a curb or step, activate your core as you balance on the support leg
- keep you pelvis level as you bend the support knee into a small squat
- increase the challenge by doing this exercise on a Bosu® or other unstable surface

FIGURE 4 AND 5. SINGLE LEG STEP DOWN

C. Lunges (Figure 6)

- In standing, activate your core
- Use your hands on your pelvis to feel for loss of stability
- Step forward with one leg so that you feel a slight stretch at the front of the back leg
- Lower your body by dropping your weight through the knee of your back leg, which will take pressure off of your knee cap of the front leg
- The back heel will lift off of the ground
- Step back with the front leg, to return to the start position
- Repeat with the other leg in front, alternate legs

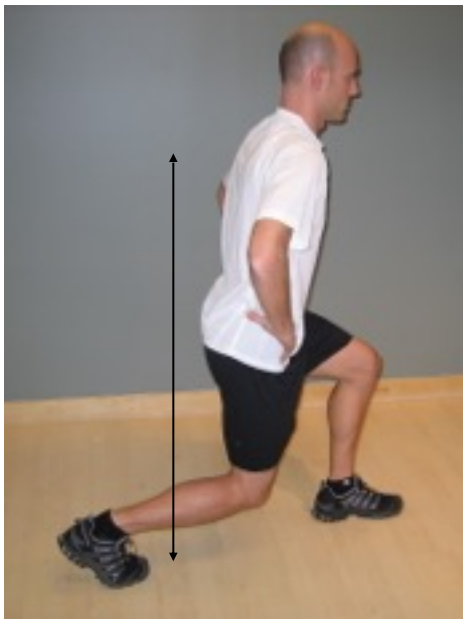


FIGURE 6. LUNGES

D. 1-2-3's (Figure 7)

- Activate your core in standing, and arms in a running pose (crossed arms makes the exercise more difficult)
- Perform three quick steps in a running motion, beginning with a right knee lift
- Stop quickly the next time your right knee is raised and pause in that position (i.e. count each time you step "1,2,3")
- Attempt to maintain balance and alignment. This exercise helps you get "fast feet"
- Repeat and the next pause will happen with your left knee raised

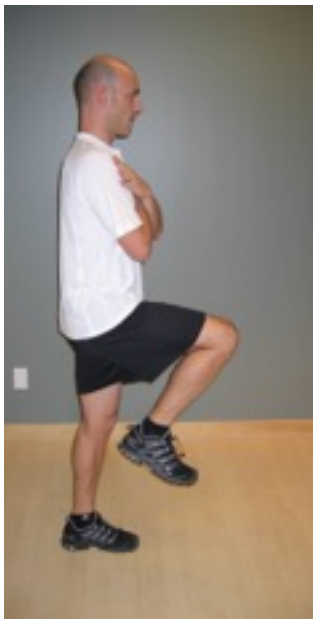


FIGURE 7. 1-2-3'S

E. Lateral lunge (Figure 8 and 9)

- Hold a weight or kettle bell in your hands
- Step to the right so that your feet are placed 2.5 times shoulder width apart

- Flex your right knee as the left knee straightens so that you move into a lateral lunge as your body lowers; your right foot, hip and knee should be “stacked” (aligned vertically)
- Your hips should move back as your shoulders come forward (see Figure 9)
- Repeat to the other side

FIGURES 8 AND 9. LATERAL LUNGES

F. Lateral Step up on Bosu® or step (Figure 10 and 11)

- Stand to the left of the Bosu® or step and then step to the right and place your foot in the middle of the surface
- Your right foot, knee and hip should be “stacked “
- Lift your left foot off the ground so that it is under you but still in the air (or if you find this difficult it can lightly rest on the surface); you should now be in a squatting position
- Return the left foot to the ground
- Repeat to the other side

FIGURE 10 AND 11. LATERAL STEP UP

4. Dynamic Stretches

These are stretches that are not held in one position, instead the body part is moved repeatedly through a motion pattern. The purpose is to rapidly take the muscles and connective tissue through multiple lengthening and shortening cycles, as happens during a run. These are the stretches you should definitely do before each of your runs (after a brief walk and jog). Begin in a slow, controlled manner and then progress the speed and range of motion over thirty seconds for each exercise.

A. Lateral leg swings (Figure 12 and 13)

- Stand with hands on a support surface (bench, wall or table in front of you)
- Activate your core
- Swing the right leg in front of you, like a pendulum on a grandfather clock and then swing it out and away from you
- Keep your toes facing straight ahead and do each side for 30 seconds
- Repeat with the other side

FIGURES 12 AND 13. LATERAL LEG SWINGS

B. Forward leg swings (Figure 13 and 14)

- Stand with your left hand on a support surface
- Activate your core
- Swing the right leg forwards and backwards, like a pendulum with your toe pointing straight ahead
- As you increase the speed, do not allow excessive flexing or extending of your low back (30 seconds per side)

FIGURES 13 AND 14. FORWARD LEG SWINGS

C. Calves and Achilles tendon (Figure 15)

- Lean forwards with your hands on a supportive surface
- Slowly raise your self up onto your toes and then drop your heels back down
- Gradually increase the speed of the repeated movement
- repeat for 30 seconds

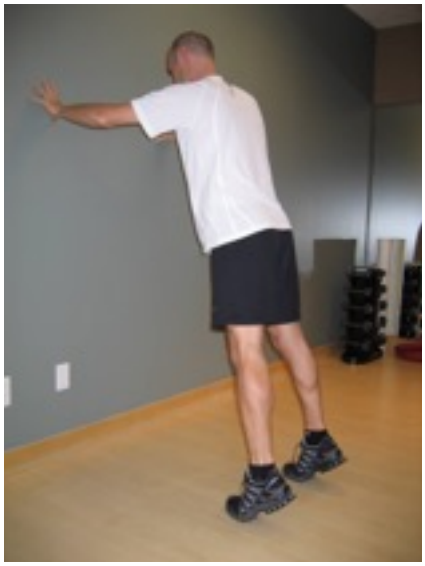


FIGURE 15. CALVES AND ACHILLES WARM UP

Skips

Skipping is a great way to increase leg turn-over (leg speed), strengthen the leg muscles and increase joint strength and stability. They are often used in a dynamic warm up.

A. High Knee Skips (Figure 16)
- slowly move forward over a 10 metre distance as you quickly drive your knees upwards, towards your chest (but only go to waist height)
- repeat for 2 -3 lengths of 10 metres

B. Butt Kickers (Figure 17)
- slowly move forward over a 10 metre distance as you try to hit your heels into your backside
- repeat for 2 -3 lengths of 10 metres

FIGURE 16 AND 17. SKIPS

5. Static stretches

Static stretches are held for a relatively long period. Do three repetitions of 30 seconds per side unless stated otherwise. Static stretches serve to lengthen shortened muscles, fascia (muscular connective tissue) and tendons. Some authorities call them corrective stretches because they help to ameliorate the tightening effect that running has. I suggest you do the following stretches following each run.

A. Soleus Muscle and Achilles Tendon (Figure 18)

- Activate your core and keep your back straight
- Stand in front of a wall about 2 arms lengths away.
- Lift up your right heel, place it down heel first
- Step forward with left foot into a lunge position and place your hands on the wall, keeping the feet pointing straight ahead
- Bend the right knee
- **Don't do this if you currently have a sore Achilles !**

B. Gastrocnemius Muscle (Figure 19)

- As above back but keep the back leg straight
- Reverse to stretch the left calf

FIGURE 18 AND 19. CALF STRETCH

C. Hamstrings (Figure 20)

- Lie on your back, with your heel placed on a door frame, the other leg flat on the ground
- Relax there for one minute and then switch sides
- **Cease or reduce the stretch if you feel tingling or numbness in your toes! (which is due to a stretch on the sciatic nerve)**

FIGURE 20. HAMSTRING STRETCH

D. Standing Hamstring stretch / Active Isolated calf and hamstring stretch (Figure 21)

This position can be used for two forms of stretching:

1. Static hamstring stretch
    - Lean forward with right heel on the ground until you feel a stretch in the hamstrings at back of thigh; hold 3 X 30 sec per side

2. Active Isolated calf and hamstring stretch

- With right heel on ground, use the muscles on the front of the shin to actively pull the toes of the right foot towards shin
- At the same time lightly tighten quadriceps (front of thigh) muscles
- Hold this for 2 seconds, then relax; repeat 10 times per side

FIGURE 21. ACTIVE ISOLATED AND STATIC STRETCH POSITION FOR HAMSTRING AND CALF

E. Quadriceps

1. Half Kneeling Quadriceps Stretch (Figure 22)

- To stretch the right quadriceps, kneel with right knee on a pillow, right hand pulling up on your right foot, left foot on the ground and left hand on a couch/bed
- Activate your core
- Lunge forward by moving your pelvis forward as you bend the left knee
- Reverse to stretch the left quadriceps

FIGURE 22. HALF KNEELING QUADRICEPS STRETCH

2. Standing Quadriceps stretch (Figure 23)

- If stretch (A) above irritates your knee, then try this stretch
- Place foot onto chair/bed behind you (or hold onto it with the right hand), as you balance with hands on a support
- Activate your core and stay tall (knee/hip/shoulder in vertical line)
- Bend the support leg until you feel a stretch

FIGURE 23. STANDING QUADRICEPS STRETCH

F. ITB (Ilio-tibial band) in kneeling (Figure 24 and 25)
The ITB is a tough band of tendon running from the outer thigh, to the outside of the knee. Many knee and hip related injuries in runners and cyclists are due to tightness in the ITB.

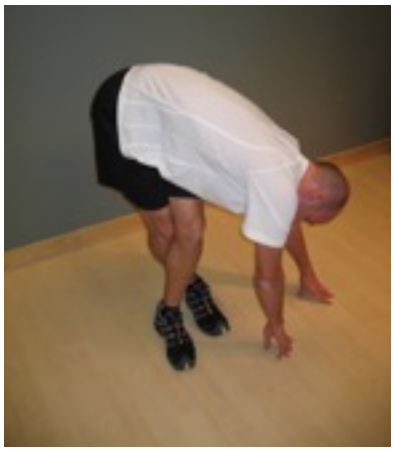
- To stretch the right ITB, kneel with right knee on a pillow and left knee directly in front of the right knee
- Place left hand on support , right hand on hip
- Activate your core
- Lunge forward by moving your pelvis forward as you bend the left knee
- Push your hips to the right

(note: if you do not feel a stretch you may have relaxed your core and your low back has arched)

FIGURE 24 AND 25. ITB IN KNEELING

G. ITB IN STANDING (FIGURE 26)

- This stretches the back of the right ITB and the outer hamstring
- Cross left leg over the right and lean over forwards; bend knees
- Rotate trunk to the left and touch floor or your shins
- Reverse to stretch the left ITB



G. ITB IN STANDING

H. ITB in Sidelying (Figures 27, 28, and 29)

- Lie on your right side and use your left hand to hold onto you left foot (Figure 27)
- Take your left knee in a circular pattern (forward and up, then trace a 1/2 circle in the air with your knee as you bring the knee behind you) (Figure 28)
- he knee must be behind your hip, such that you feel your hip flexors stretching
- ow let gravity take the knee down towards the ground or apply downward pressure with the outer aspect of your left foot (Figure 29).
- You should feel a stretch on the outer aspect of your left thigh

FIGURE 27. ITB IN SIDELYING : INITIAL POSITION

FIGURE 28. ITB IN SIDELYING: MIDDLE POSITION

FIGURE 29. ITB IN SIDE-LYING: FINAL POSITION

I. Open book spine stretch (Figure 30)

- Do not do this if your back or shoulder is sore: seek the assistance of a physiotherapist for advice.
- Lie on your left side, with knees bent and arms straight out in front of you and touching each other
- Take a big breath in and as you breathe out, slide your right hand across your chest and let your trunk rotate to the right
- If you are flexible enough, you can let the right arm rest on the floor, such that both arms are stretched out. If that is too uncomfortable or the right arm does not touch the floor, then let the right hand rest on your chest.

FIGURE 30. OPEN BOOK SPINE STRETCH (FINAL POSITION)

J. Piriformis (Figure 31)

- The piriformis runs from the sacrum (tail bone) to the outer part of the top of the femur
- Lie on your back and place left foot on wall
- Cross right foot over bottom of left thigh
- Relax muscles in hips and low back and feel a stretch in right buttock
- If you do not feel a stretch, move your body closer to the wall or pull the left thigh towards you using your hands

FIGURE 31. PIRIFORMIS STRETCH

6. Foam Rolling

A foam roller can be used to help you stretch out fascia in your leg muscles, reduced your body's sensitivity to muscular pain, and relax tight trigger points. It has been proposed that trigger points develop in a muscle from repetitive muscle activity that has not been countered by appropriate stretching afterwards (sounds familiar to a busy runner!). A future article on our blog (www.pureformphysio.ca) will discuss the proposed effects of foam rolling. There are two basic techniques; both are helpful. The first technique is to relax trigger points. Lie on the foam roller in the area you want to work. When you find a sore, achy spot in your muscle, just remain there. Do not move off that spot, and within 30 seconds or so the ache should begin to dissipate. After a minute or so, move onto the next sore spot. The second technique is to stretch out fascia. As previous, you lie on the area you want to work, but this time you move your body back and forth over the sore area (like pizza dough rolling itself on a rolling pin!).

A. ITB (Figure 32)

- Lay with the right thigh on the roller
- Move up and down the roller by applying pressure on the ground through the right forearm and left foot
- Repeat on the other side

FIGURE 32. FOAM ROLLING ITB

B. Hamstrings (Figure 33)

- Place the roller under your right hamstring and cross left foot over upper thigh
- Move up and down the roller by applying the pressure through the right heel and your hand

FIGURE 33. FOAM ROLLING HAMSTRINGS

C. Hip Flexors and Quadriceps (Figure 34 and 35)

- Lie with roller under front of right thigh
- De-activate the trigger points on your hip flexors
- Move up and down on roller by applying pressure through the left foot and both forearms

FIGURE 34. FOAM ROLLING THIGH

FIGURE 35. FOAM ROLLING THIGH

7. Putting it all together

We have now covered core stability, dynamic warm up, different forms stretching and the use of a foam roller for many of the key running muscles. So what do you do with this information now? These exercises can slide in seamlessly to a well designed running training program. Core training should be done three times a week, preferably through-out the entire training cycle. It would be best to do core work on your easy run days.

All runners would likely agree that a warm up and cool down is vital to a good run that does not leave you injured or sore. My tried and tested warm up and cool down goes as follows:

1. Perform ten **active isolated calf/hamstring stretches** on each leg
2. Walk then **jog lightly** for about five minutes
3. Perform all of the **dynamic warm up stretches** (this takes about three minutes)
4. if you are going to do a faster run or a tempo run, do the **skips**
5. **Run** for X minutes
6. Begin **cool down** by running slower for the last 5 minutes of the run
7. **Walk** for 2 minutes
8. Perform one **static stretch** for each of : quadriceps, hamstrings, ITB, calf, piriformis and spine
9. **Foam roll** three times per week, more often if you are feeling sore/tight

This manual are not intended as a book on self-treatment. However, if an injury does occur, the following advice is generally appropriate:

1. Take time off running or significantly reduce the duration and intensity of your runs.
2. Apply ice for two repetitions of 10 minutes to the area, with a ten minute rest in between.
3. If the pain is severe seek medical advice. If the pain is mild or moderate but is affecting your ability to run and lasts more than a week, see a health care professional that has experience in treating running injuries. All of the therapist at Pure Form Physio are highly skilled in managing running related injuries

I hope you have enjoyed this manual. Enjoy your running and stay healthy!

- Daniel Sivertson (Physiotherapist) . April 2015

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