

The Importance of Core Stability to Prevent and Treat Running Injuries

by Reed Ferber, PhD, CAT(C)

The Alberta CSEP has developed an additional way for you to obtain professional development credits. Read the following researched article and complete the corresponding exam. Mail the exam to the Alberta CSEP for grading (80%+ is a passing grade). This exam is worth 1.0 CSEP PDC credit.

Core stability training is gaining popularity in the running community as more runners are made aware of how weakness in the “core” of the body can negatively influence lower extremity biomechanics and running performance. The lumbar, pelvis, and hip region together are considered to be the core of the body and optimal core function involves both mobility and stability. Proper core stability can help maximize running performance, maintain the centre of gravity over the base of support, control lower extremity limb motion while running, and help prevent running injuries.

From a biomechanical perspective, proper core strength is essential to adequately control and allow proper biomechanics while running. In addition, it has been hypothesized that hip muscle weakness can play a significant role in the development of running-related injuries. A study by Niemuth (2005) investigated a group of 30 runners with a variety of running injuries compared to runners with no injuries. Factors such as training, leg dominance, anatomical alignment, previous injuries, and hip muscle strength were analyzed to determine what factors play the greatest role in the development of running injuries. The results indicated that the injured runners demonstrated significantly weaker hip abductor (located on the outside of the hip) and hip flexor (located on the front of the hip) muscles compared to their non-injured limb and compared to the control group. A study by Ferber (2006) sought to determine if rehabilitation involving hip strengthening and flexibility could effectively resolve pain associated with various running-related injuries. Patellofemoral pain syndrome, iliotibial band syndrome, medial tibial stress syndrome, Achilles tendinopathy, and plantar fasciitis accounted for the majority of injuries. Measurements of hip muscle strength were recorded and



From a biomechanical perspective, proper core strength is essential to adequately control and allow proper biomechanics while running

each patient’s running biomechanics were analyzed. Based on the biomechanical and clinical evaluation, a rehabilitation program was prescribed to improve hip strength when necessary. Upon follow-up, patients reported a 75 per cent improvement in pain on average and 89 per cent reported at least a 50 per cent improvement in pain. Subsequently, these patients also exhibited significant improvements in hip muscle strength. These results suggest that a hip strengthening rehabilitation program, based on the biomechanics of running, can effectively resolve pain associated with running injuries. Surprisingly, these studies are the first to show an association between hip muscle strength and the development and rehabilitation of overuse running injuries.

Both of these studies suggest that core strengthening exercises should be one part of an overall running, strength, and flexibility program to help prevent common running injuries. While these studies involve a variety of running related injuries, other studies have also suggested that core stability is a primary contributing factor to the development of iliotibial band syndrome.

Iliotibial band syndrome (ITBS) is the second leading cause of knee pain in runners and is the number one cause of lateral knee pain (Taunton, 2002). ITBS is an overuse running injury that results from repetitive friction of the IT band over the outside of the knee joint. One of the hip abductor muscles, the tensor fascia latae, is located within the IT band and functions to reduce lateral forces during running. Some authors have suggested that weakness or inhibition of the hip abductor muscles leads to a decreased ability to stabilize the pelvis and adequately control lower limb alignment while running thus resulting in excessive forces sustained by the IT band.

Fredericson (2000) randomly selected 24 runners with ITBS and compared hip abductor strength to a control group of 30 non-injured runners. Similar to the findings of Niemuth (2005), these authors also reported that runners with ITBS exhibited significantly weaker hip abductor muscle strength in the affected limb compared to the non-injured limb and compared to the healthy runners. These authors also reported that following a six-week hip abductor strengthening program, 22 of 24 ITBS patients demonstrated a 35 per cent to 50 per cent increase in abductor muscle strength and were free of ITBS pain while running. Therefore, this study is strong evidence that a relationship exists between hip abductor muscle weakness, side-to-side imbalances in strength, and the development and effective treatment of ITBS.

While the Fredericson study demonstrates a link between hip muscle strength and ITBS, there is only one study that has examined running biomechanics in runners with ITBS. Ferber (2010) examined differences in running biomechanics between 35 runners who had previously sustained ITBS and 35 runners with no knee-related running injuries. Using a three-dimensional camera system to measure joint angles, along with force plates to measure ground impact, knee and hip joint forces were calculated.

The results indicated that the ITBS group exhibited a significantly greater peak hip and knee angles similar to a more “knock-kneed” running posture and significantly greater knee joint forces compared to the control group. Similar to the other investigations, these authors also suggested that weakness of the hip abductor muscles may result in changes in running biomechanics which may require greater passive restraint from the IT band while running and, over time, lead to ITBS. It is important to note that the study by Ferber et al. (2010) was retrospective in nature and involved runners who were pain-free at the time of testing but had previously sustained ITBS. However, a prospective study of ITBS by Noehren et al. (2007) conducted in the same laboratory under similar conditions, but with different subjects, also showed similar results. Therefore, adequate hip muscle strength, in particular the hip abductors, and proper core stability is important to help prevent running injuries.

References available on request.

Reed Ferber is the director of the Running Injury Clinic in Calgary, Alberta, and an assistant professor in the Faculties of Kinesiology and Nursing at the University of Calgary. Dr. Ferber is a board certified athletic therapist and holds a PhD in gait biomechanics and sports medicine. He specializes in research and clinical treatment of lower extremity injuries and is also a Population Health Investigator through the Alberta Heritage Foundation for Medical Research. For more information visit the website at www.runninginjuryclinic.com or email him at rferber@ucalgary.ca.



PDC EXAM: THE IMPORTANCE OF CORE STABILITY TO PREVENT AND TREAT RUNNING INJURIES

Read the previous researched article and complete this corresponding exam. Mail the exam to the Provincial Fitness Unit of Alberta for grading (80%+ is a passing grade). This exam is worth 1.0 CSEP CEP PDC credit

1. Which muscle is located within the iliotibial (IT) band?
 - a. gastrocnemius
 - b. tibia
 - c. tensor fascia latae
 - d. iliocostalis
2. What are the three muscle groups that support the core in running performance?
 - a. pelvis, lumbar and rhomboids
 - b. pelvis, hip and biceps
 - c. lumbar, pectoral and gluteus
 - d. lumbar, pelvis and hip
3. The only essential element that allows for proper biomechanics while running is core endurance.
 - a. True
 - b. False
4. Which is not true regarding weak hip abductor muscles in a runner?
 - a. decreased ability to stabilize the pelvis
 - b. decreased flexibility will increase the strength of abductor muscles
 - c. excessive force is exerted on the IT band
 - d. improvement in pain and hip muscle strength with hip strengthening exercise
5. Patellofemoral pain syndrome, IT band syndrome (ITBS), medial tibia stress syndrome, Achilles tendinopathy and plantar fasciitis are all examples of running pathologies that can be treated with hip strengthening exercises.
 - a. True
 - b. False
6. We can strengthen muscles to prevent and improve running injuries. Which of the following muscles or muscle groups are not directly involved in running injuries?
 - a. pelvis
 - b. hip abductors
 - c. pectorals
 - d. lumbar
7. IT band weakness is associated with weakness of the tensor fascia latae.
 - a. True
 - b. False
8. What is the second leading cause of knee pain in runners?
 - a. weak abdominals
 - b. Achilles tendinopathy
 - c. plantar fasciitis
 - d. iliotibial band syndrome
9. The term “knock-kneed” refers to large joint angles of the knee and hip in a runner’s posture which can contribute to ITBS.
 - a. True
 - b. False
10. Runners with iliotibial band syndrome (ITBS) can or do have all the following except:
 - a. side-to-side imbalances in strength
 - b. good core strength
 - c. lateral knee pain
 - d. abductor muscle weakness