

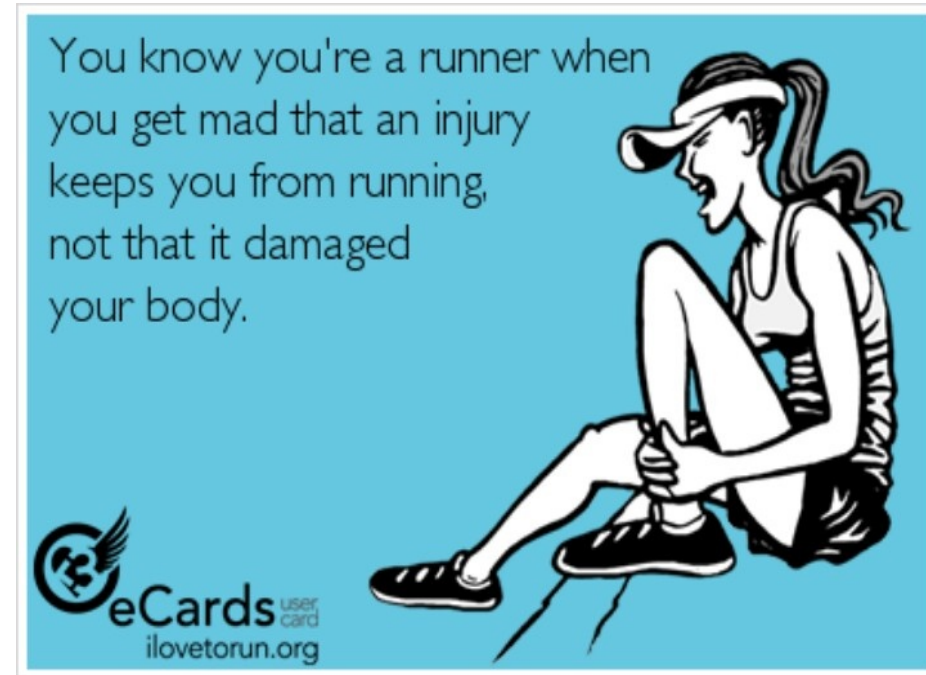
Running Injuries in Women – Tips for Successful Treatment



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Running and Injuries

79% of runners that run more than 12 miles per week will get injured at some point within a 12 month span.



Van Gent et al 2007

Running Injuries in Women

Women are reported to be twice as likely to suffer from certain running injuries such as PFPS, ITBS and tibial stress fractures as compared to their male counterparts.



Tauton et al., 2002

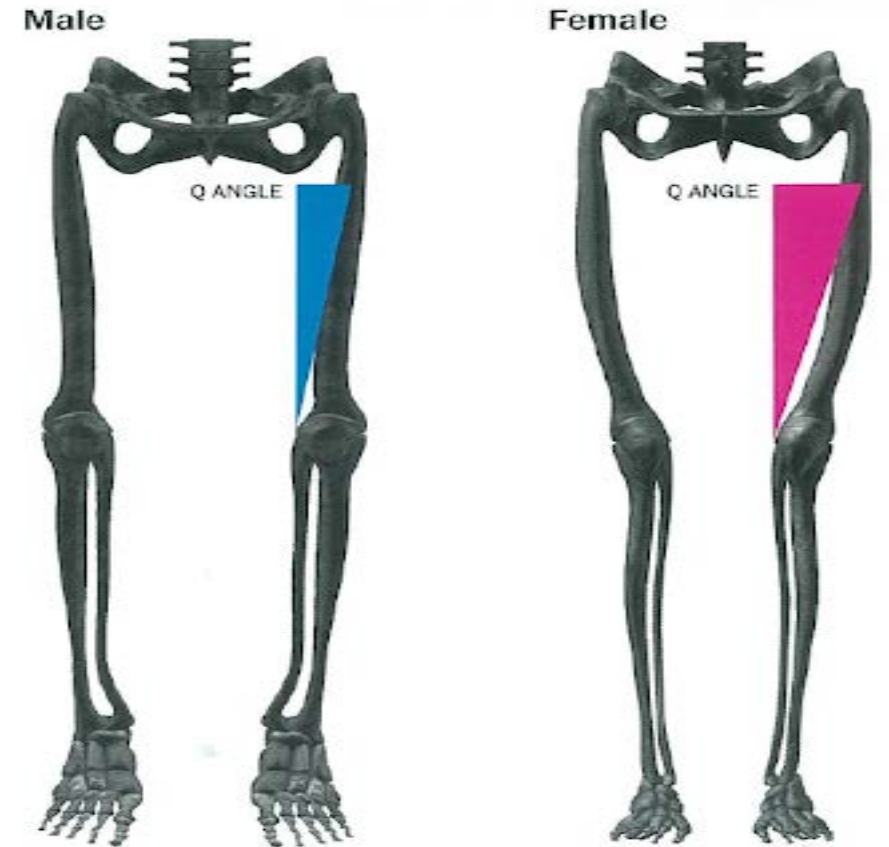


WHY?

- Body Structure?
- Differences in Running Mechanics?
- The Female Athlete Triad?

Body Structure

- Women have a larger hip width to femoral length ratio which leads to greater hip adduction. (Horton and Hall, 1998)
- This increased angulation of the femur contributes to a greater genu valgus.
- Women have been shown to have greater active hip IR than men. (Simoneau et al., 1998)
- These in combination can explain the larger Q-angle found in women.



Differences in Running Mechanics

- Study from 2001 looked at knee kinematics in 11 male and 9 female runners in the sagittal and frontal planes.
- Women exhibited 11 degrees more valgus throughout the stance phase.
- Women found to exhibit less peak knee flexion and less knee flexion excursion compared to men
- In this study, they did not look at hip kinematics.



Malinzak et al., 2001



Differences in Running Mechanics

- Study in 2003 compared hip and knee kinematics in 20 male and 20 female recreational runners.
- Female recreational runners had a significantly greater peak hip adduction, hip internal rotation and knee abduction angle compared to the males.

Ferber et al., 2003



The Female Athlete Triad

1. Energy deficit – unhealthy eating habits or excessive exercise
2. Loss of regular monthly period
3. Lower bone mineral density

*The greater the number of triad risk factors is associated with increased risk for bone stress injuries. (Barrack et al., 2014)



Why is it so important to watch our runners actually run???????



The Effect of a Hip Strengthening Program on Mechanics During Running and During a Single-Leg Squat

(Willy et al. 2011)

- 20 healthy females with excessive hip ADD while running
- Exercised 3x/wk for 6 weeks targeting hip ER and ABD
- First 2 weeks NWB and last 4 weeks WB exercises
- Final 3 weeks – single-leg squats added



Results – Willy et al. 2011

- Significant gains of strength in hip ER and ABD
- Reduction of hip ADD and CPD seen in single-leg squats
- No changes seen in abnormal hip mechanics during running

Mirror Gait Retraining for the Treatment of Patellofemoral Pain in Female Runners

Willy et al. 2012

- Visual feedback provided by a mirror – 10 females
- Instrumented analysis pre and post training: running, SLS and step descent
- Mirror placed in front of treadmill – 8 sessions over 2 weeks
- Verbal cues given: “run with knees apart and with kneecaps pointing straight ahead” & “squeeze your buttocks”
- Feedback gradually removed in the last 4 sessions

Results – Willy et al. 2012

- Reduced peaks of HADD and CPD during running
- Skill transfer: SLS and step descent
- Improvements of pain and function through 3 months post retraining



Cadence

- Count number of times that both feet strike the treadmill in 1 minute
- Increasing the cadence by 10% can reduce center of mass vertical excursion, braking impulse and mechanical energy absorbed at the knee. (Heiderscheit et al 2011)
- Some suggest that 180 steps per minute ideal.
- Easy to use a metronome app.



Treadmill Set-up and Warm-up

- Run at a pace that matches a “long run” or the pace when they experience pain.
- Video a minimum of 2 views – we use dartfish app
- A 6-10 minute warm-up is recommended if possible.

Souza 2016



3 Most Common Injuries in Female Runners

- PFPS
- ITBS
- Bone Stress Injuries



PFPS

- 19-30% female runners vs 13-25% male runners
- Characterized by gradual onset of anterior or retro-patellar knee pain. Usually experienced under loading and compressive forces.
- PFPS is thought to be multi-factoral.
- 70-90% have chronic or recurrent pain





Risk Factors for PFPS

1. Local Joint Factors

- Patellar Maltracking or Hypermobility
- Quad Weakness
- Delayed VMO Activation
- Decreased Flexibility – quads, gastrocs, ITB, HS

Dutton et al., 2016





Risk Factors For PFPS Cont.

2. Lower Extremity Biomechanics

- Hip Muscle Dysfunction – ABD/ER weakness, impaired hip muscle endurance, NM incoordination
- Foot Over-Pronation
- Gait Deviations - excessive hip add/ir, increased GRF, heel foot strike pattern



Risk Factors For PFPS Cont.

3. Training

- Novice runners
- increasing intensity and frequency
- excessive hill work
- decreased recovery time
- high mileage



Treatment of PFPS

1. Quad and/or Hip Weakness – Strengthen
2. Delay VMO Activation – Biofeedback
3. Patellar Maltracking and Hypermobility – Bracing/taping
4. Decreased Flexibility – Stretch quads, HS, gastrocs and ITB
5. Foot Over-Pronation - Foot orthosis
6. Training Errors – Rest, patient education
7. Gait Retraining – Gait retraining with visual and verbal feedback

Dutton et al., 2016



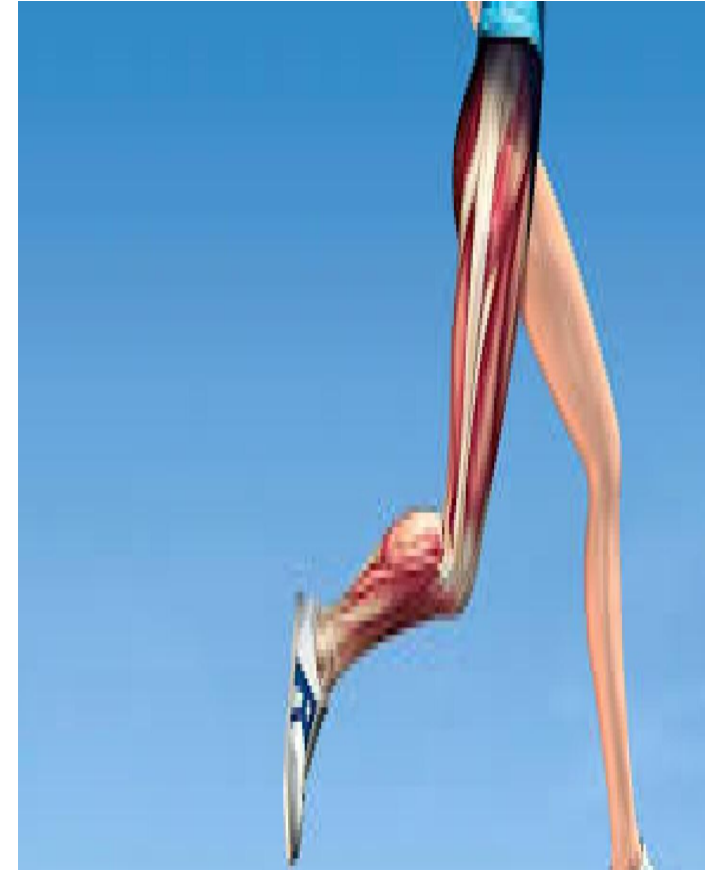


Gait Retraining for PFPS

1. Verbal and Visual Feedback to Reduce Dynamic Hip ADD and IR (Willy et al., 2012)
 - Use mirror in the clinic
 - “Keep knees pointed forward”..... “Don’t let feet cross midline”
2. Increase Cadence (Lenhart et al., 2014 & Heiderscheit et al., 2011)
 - Swing arms quicker, use metronome or an app that changes tempo of their music
3. Lean Forward at Hips Approx 7 Degrees (Teng and Powers, 2014)

ITBS

- Incidence 5-12% of all runners. (van der Worp et al., 2012)
- Most common reason for lateral knee pain in runners.
(van der Worp et al., 2012)
- Two Theories on Etiology
 1. Compression
 2. Friction and Impingement
- ITBS occurs in the deceleration phase of running (heel strike to peak knee flexion).
(Orchard et al., 1996)





Risk Factors For Development of ITBS

Intrinsic Risk Factors

- Leg length discrepancy
- Genu Varus
- Pre-existing ITB tightness
- Weakness of knee extensors, knee flexors and hip abductors

Extrinsic Risk Factors

- High weekly mileage
- Interval training
- Running on the same side of the road – if roads are canted
- Hills – especially downhill

Beals and Flanigan, 2013

Women and ITBS

- Biomechanical analysis has shown increased hip abduction, knee internal rotation and femur external rotation in females with ITBS compared to age related controls.



Noehren et al., 2007



Treatment of ITBS

- Manual treatment to TP's – biceps femoris, VL, Gmax, TFL
- Iontophoresis with dexamethasone
- Manual and self stretching of stretching ITB, VL, BF
- Initially strengthen posterolateral hip muscles in NWB
Clamshells, SL hip abduction, bridges (bil and single leg), side-planks
- Standing exercises and PRE to posterolateral hip
Isometric Gmed presses into the wall with ball and without (hold for 5-15 seconds), SL dead lifts, SL squats, hip hikes
- Gait Retraining

Baker and Fredericson, 2016

Gait Retraining for ITBS

- Look at pelvic control
- Avoid over-striding
- Increase cadence (Heiderscheit et al., 2011)
 - Increase by 10%, “run quietly”, “let your feet strike under your body”

Baker and Fredericson, 2016

Bone Stress Injuries

- BSI's result from the failure of bone to withstand repetitive, submaximal forces from running.
- Common Sites include the tibia, fibula, metatarsals, tarsals, calcaneus and femur.
- Females at greater risk for BSI's.
- BSI's may account for greater than 20% of injuries in runners.
- Early identification is important.



Tenforde et al., 2016

Risk Factors

1. **Biological Factors**

Female

Genetics

Meds - anticonvulsants, steroids, antidepressants and antacids

Female athlete triad

Dietary contributors - insufficient calcium and vitamin D

2. **Biomechanical Factors**

Training - volume and intensity

Bone - thinner cortex, lower bone mineral density

Anatomic considerations - LLD, lean mass, foot type, smaller calf cross sectional area

Tenforde et al., 2016

Treatment of Stress Fractures

- Achieve pain-free ambulation and no pain with provocative maneuvers.
- Initiate non-impact loading to maintain fitness - deep water running/antigravity treadmill.
- Patients should be counseled to maintain good caloric intake.
- Ensure adequate intake of vitamin D and calcium.

Gait Retraining for BSI's

- Can increase cadence by 10%. (Heiderscheit et al., 2011)
- VC's to land softly.
- Could try orthotic if you feel foot type is a contributing factor.
- Could change from heel striker to forefoot striker.



In Summary.....

- Female runners have a higher incidence of PFPS, ITBS and tibial stress fractures than male runners.
- Remember to do a complete evaluation looking at strength and flexibility.
- Ask your patient what they are doing in their training at home.
- Look at their running mechanics.

Thank You!!!





Baker and Fredericson, 2016



 emoryhealthcare.org/ortho