Knee Pain Guide for Runners
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As a runner, chances are that you know someone who has experienced some type of knee pain while running.

Some estimates even show that around 75% of runners will experience at least one small knee injury every year.

But it doesn’t have to be this way!

In this article, I will go in-depth on every knee injury that you could experience as a runner. You should learn what occurs with each injury, how to rehab them, and also how to prevent them.

The injuries you will learn about are:

- IT Band Syndrome
- Runner’s Knee (Chondromalacia Patella)
- Plica Syndrome
- Patellar Tendonitis
- ACL injury

You can click on any of the above options to skip directly to that section, but I recommend reading fully through.

Many of the knee injuries have commonalities, and the more you understand about one knee injury, the more you will understand for the next.

Increasing your knowledge on the knee can also help you to understand your hip condition in greater depth.
BASICS OF KNEE MECHANICS

Let’s start with how the knee works.

The knee is a very simple joint. It works similar to a hinge on a door. (PIC)

The knee bends in only one plane of motion, but it does so very well; just like a door!

Hinges, however, do not keep their composure under any other plane of motion that is not forward and/or backward.

The knee cannot keep its composure when it is rotated or laterally bent. If someone ever says that they twisted their knee, they essentially forced it in to both of those motions that they cannot do. This is a traumatic type of injury.

Most injuries that runners sustain occur over time. Even though it may seem as though that pain started during or after one specific run, the condition develops over time. These injuries are called cumulative trauma injuries.

Minor damage of the knee will occur over time for a variety of reason, but often it tends to be poor movement patterns. You might know these movement patterns as gait in running or form in squatting, to name a couple examples.

Poor core endurance, poor hip strength, and simply never having learned to run properly could force the hinge of the knee in to the motions that it does not take well, and that leads to injury.
THE BASICS OF KNEE ANATOMY

I don’t expect for you guys to be experts in knee anatomy, and I don’t want to bore you by getting too in depth in it, but there are still some basics that you should know!

Before you think you want to just skip ahead, you should know that studies have actually shown that patients who have more education on their injury will actually recover faster and stay healthy much longer.

Why is that?

If you understand your injury, you are more than likely going to complete your rehabilitation programs, make your appointments, and change your habits in order to decrease the chance of reoccurrence.

Bones of the knee:

There are 4 major bones of the knee you should be aware of:

• The femur – also known as the thigh bone
• The tibia – also known as the shin bone
• The fibula – also known as the outer shin bone
• The patella – also known as the knee cap

The bones that create the knee joint provide structure, passive stabilization, and points of attachment for ligaments and muscle/tendon complexes.

Ligaments of the knee:

There are 4 major ligaments of the knee you should be aware of:

• The Anterior Cruciate Ligament (ACL)
• The Posterior Cruciate Ligament (PCL)
• The Medial Collateral Ligament (MCL)
• The Lateral Collateral Ligament (MCL)

A simple website search can lead to an endless supply of information on the ligaments of the knee. Specifically, there will be a ton of information on the ACL, but remember that an ACL tear is only one of the many types of knee injuries.

A majority of the knee injuries that I see in my office are not ACL injuries, so don’t let the overwhelming amount of information about the ACL on the Internet fool you.

The reason there is so much information on it is that it is a very well-studied ligament and it will often require surgical correction and extensive rehab when injured.

If a ligament of the knee is injured, it was likely result in an “unstable” knee, and the treatment surrounding this injury will focus on making the knee more stable and teaching the patient how to use it again.
Cartilages of the knee:

The knee has 2 types of cartilage that you should be aware of:

- The fibrocartilage – also known as the medial and lateral meniscus
- The articular cartilage – the “bone-on-bone” types of cartilage

The reason that cartilage appears in two different forms in the knee is because they both have very different functions. Even the consistencies of the two are very different! They do have one thing in common though: they do not have a good blood flow to them. The only exception is the outer third of the meniscus.

Because of this deficient bloody supply, the cartilage does not heal well and this can lead to long-term discomfort in the knee.

Does that mean you are out of luck if you have a cartilage injury?

No, not at all! What it does mean is that you had better come up with a plan of attack, and you better do it fast.

Tendons/Muscles of the knee:

I categorized these together because they are extensions of each other.

All muscles have tendons, and all tendons attach muscles to bone. They both function to move the joint while running.

Muscles/tendon complexes of the knee you should be aware of are:

- The quadriceps group
- The hamstring group
- The iliotibial band
- The popliteal muscle/tendon
- The adductor group
- The calf group

I tried to stay as general as I could because the truth is that it just gets more complicated from here. It’s impossible to limit the muscles that affect knee function to only the ones listed above. Any muscle of the foot, ankle, knee, thigh, hip, and/or core can have a direct effect on the knee if it were to become injured.

Many of the muscles that I mentioned are actually muscles of the hip and ankle. So, to think that they are not connected to the hip would be very narrow-minded.

From here on out, we will be discussing each injury or “syndrome,” and I will also be giving some rehab and treatment ideas along the way!

Enjoy!
IT BAND SYNDROME

- Stinging pain on the outside of your knee?
- Does your knee click?
- Does the pain come back as you stop and start again?
- Knee pain while running?

I actually had IT Band Syndrome one time in my life for about a month.

It was unbearable.

I remember was training for a ½ marathon. On one of my runs around Back Bay in Newport Beach, I reached the section where you come to the neighborhoods on the north side where there are some traffic lights.

Red light.

Green light…this is where the stabbing pain began. There was pain with every step, or every landing to be more exact. It slowly dissipated over the next 50 yards.

I saw another light coming up and of course, hit another red light again.

Green light…the stabbing pain began all over again.

I began to walk and realized this was not normal.

Iliotibial Band Syndrome (ITBS or IT Band Syndrome) is an injury that can keep you down for months if you let it. I beat it and you can too. Let’s start by learning something about it.

What creates the pain associated with IT Band Syndrome?

The IT Band is a dense, fibrous band of tissue that runs from the outer hip down to the side of the knee. It sits right on top of the lateral quad muscle, and when it gets to the knee, it runs over a bursa. This bursa is normally located there to decrease friction between the IT band and the bone of the knee that lays deep to it.
Pain develops as the IT band is compressed into the bony area (lateral condyle) of the knee. It is commonly called a friction syndrome.

**What causes the friction of the IT band on the bone?**

The most common answer you’ll find on the web is “tightness of the IT band.”

But what is the truth?

It’s a combination of strength, coordination and endurance deficiencies of the core, hip and ankle. Some call the knee the “red-headed stepchild of the leg”. It’s never its fault, but it always gets blamed.

What’s the real story?

First off, it’s important to know the IT Band does not stretch…maybe a tiny bit, but really not much at all. It is a structure of support just like the ACL. One of its functions is to provide lateral support to the hip and knee…so why would we even attempt to stretch it anyway?

I don’t know of any runner who spends their mornings trying to stretch their other joint-stabilizing structures like the ACL, PCL, and stiff ankle ligaments, which can often be sprained/torn.

Not buying it yet?

Look at what the research says about IT Band Syndrome.

In 2010, an article from The Journal of Orthopedic & Sports Physical Therapy looked at the differences between the biomechanics of runners plagued by IT Band Syndrome and those who weren’t (so called non-injured/healthy runners).

In the study, they looked at and compared three things between the two groups:

- Hip biomechanics
- Knee biomechanics
- Ankle biomechanics
In the past, researchers have theorized that IT Band Syndrome comes from any of the following: (Ferber 2010)

- Excessive rearfoot eversion
- Greater internal rotation of the tibia (where the band attaches)
- Weakness of the hip adductors (on the sides) creating more adduction in running gait (crossing the leg past midline when looking head on)

Technical, I know, but hang in there. (I said we were going in-depth, didn’t I?)

**Let’s start with the ankle**

In this study, they found no correlation with IT Band Syndrome and rearfoot eversion (in laymen’s terms, some might call that “flat feet”). In fact, the IT Band syndrome group actually had less eversion ("pronation or flat feet") than the non-injured group.

“How could that be?” you might ask. They found that the IT Band group actually had higher activation of the opposing muscles of the ankle, which do the opposite motion, called inversion. Inversion would be like running on the outer parts of your feet.

Perhaps, this is a compensation mechanism…we don’t know for sure.

Even if ankle eversion was a significant finding in IT Band Syndrome cases, there is a lot of variability in how much eversion is too much. There is not a direct, one-to-one relationship in degrees of motion between rearfoot eversion and tibial rotation.

So if you’re wearing orthotics and you are still having IT band pain, perhaps we should look into the hip and then the knee itself.

**Does the hip have a correlation with IT Band Syndrome?**

Ferber’s study points to poor biomechanics of the hip as a reason for IT Band Syndrome due to significant increases in hip adduction or crossing the midline. Correction of this problem via strengthening of the hip abductors over a six-week course showed improvement in 22 out of 24 runners with IT Band Syndrome and knee pain while running (Fredicson 2000).
So, getting stronger hips is the answer?

Just six weeks of hip strength training resulted in pain-free running in 92% of runners.

For those of you interested in this study there is a reference in our resources.

If you have been studying causes of IT Band Syndrome then you have a run across the topic of internal tibial rotation.

Does internal tibial rotation cause IT Band Syndrome?

Studies have been indicating that it is not as big of an issue as we originally thought.

So am I saying there is no internal tibial rotation with IT Band Syndrome?

Not at all.

Internal rotation of the tibia is not something that just happens, but according to this research, ankle biomechanics is NOT the main cause in IT Band Syndrome. What is causing it to rotate is a different process altogether.

Why is all of this information important to you?

If the hip and ankle are factors in IT Band Syndrome, then it is more than a knee problem, correct?

So, there is more to it than just foam rolling till we are black and blue?

Definitely!

A rehab program for IT Band Syndrome encompasses core exercise, squats, lunges, hip band work, and ankle proprioception drills to name a few. I know it sounds complicated, but it really isn’t.

Here are a few exercises I start people on if they have knee pain while running:

**Deadbug:**
Stop just foam rolling your IT Band and taking excessive time off. You can be moving towards your running goals during your downtime from running; but stretching and wishing you could run is not the best plan of attack. Have someone assess what your problem is, get on a training plan, and get back to running within a few weeks. This will just be a hiccup on your path to becoming a healthier runner.

Here are some other treatments and/or factors that can assist you in recovering from IT Band Syndrome and decrease knee pain while running:

- Active Release Technique
- Deep Tissue Massage
- Anti-inflammatory Injections
- Prolotherapy
- Chiropractic Adjustments or mobilizations
- Strength training/rehab
- PRICE therapy
- Running gait training
- New shoes
- Better roads
**PATELLAR TENDONITIS**

- Pain just under the kneecap...on the tendon?
- Painful and tight when you’re just standing up?
- Scared of pain associated with stepping off of a curb?
- Knee pain while running?

This does not have to be the injury that takes you out of running. This will not be your last race.

In this section of the article, you will learn the ins and outs of Patellar Tendonitis. More detailed and easier to understand then the last page you read...which was probably WebMD, huh?

**What is Patellar Tendonitis?**

Patellar Tendonitis can feel like pain just below (inferior to) the kneecap at the inferior pole down to the tibia, but it can also be present at the top of the kneecap and run into the superior portion as well.

Looking at the anatomy of the patella, it is not hard to see it is a unique bone because it is encased in a tendon. It is called a sesamoid bone.

Its purpose is to create mechanical advantage as a tendon crosses a certain joint, in this case, the knee joint.

**What causes Patellar Tendonitis?**

- Overuse
- High intensity and frequent physical activity
- Muscular/skeletal instability
- Malignancy of bone
- Tightness of the muscles surrounding the area
- Obesity
- Patella alta

**What creates the pain associated with Patellar Tendonitis?**

The patellar tendon is just like any other soft tissue structure of the body. If you demand too much from it, eventually it will fail.

This is exactly what happens. The tendon is exposed to too many miles, too much concrete, or too much improper running mechanics.

The tendon becomes irritated and starts to yell at you.

“Hey! You’re hurting me. Stop!”
Do most people stop?

No.

Typical treatment is an anti-inflammatory remedy such as pills or ice. Remember, inflammation is a natural process. Your body is telling you something.

**What is your body telling you?**

Change something because what you’re doing isn’t working.

Does this mean you have to stop running forever? Not at all, but you may have to decrease your mileage a bit to “cool the knee down” while you rehab.

Research has shown Patellar Tendonitis can be treated with rehab of the core, hip, thigh and ankle. Imbalances of the muscles of the pelvis and thigh would be my first guess as to what causes most cases of Patellar Tendonitis in the first place. Usually, if we work from this assumption and move our way towards gait analysis later in the program, it goes fairly well. With Patellar Tendonitis, if you look at gait too, soon there will be false positives.

*I know all of this information is cool, but you just want to know what can decrease the pain, right?*

Isolated treatment of pain in the tendon is important though. Some treatments that I suggest are coming up.

**What are some options for Patellar Tendonitis treatment?**

Treatment of the area of pain is critical in decreasing knee pain while running and rehabbing the area. All of these are great options:

- Rest the area
- Stretching
- Ice treatment
- Non-steroidal anti-inflammatory medications
- Chopat straps/braces
- Active Release Technique®
- Surgery
- Corticosteroid injection
- Massage
- Platelet rich plasma
Here’s one of the ball mobilization exercises that really seems to free things up. Rolling out the quad group will decrease the amount of tension on the kneecap and the patellar tendon that’s attached to it.

Here’s one of the rehab circuits I like to start my runners out with. Everything can be scaled back, and the hardest part will be squatting. I know there is squatting in this circuit, and if done more in a box squat pattern, it will decrease the pain. Increasing height will assist as well.

What test can rule in the need for Patellar Tendonitis treatment?

• X-ray’s will rule out if there is a problem in the bone
• Definitive answer is an MRI
• Diagnostic Ultrasound
• Physical exam by a medical professional
PATELLOFEMORAL PAIN SYNDROME (RUNNER’S KNEE)

- Does your knee sound like a rusty door hinge?
- Does it swell after a run?
- Thinking you’re just “getting old”?  
- Knee pain while running?

This does not have to be the end. You don’t have to start cycling or swimming just yet.

You can run again with the right rehab.

In this section of the article, you will learn about the most common knee injuries experienced while running. You will learn about common treatments and rehab exercises.

But most of all, I want you to know you are not alone. Many runners have gone through this before and have come out fine. But with an injury like Runner’s Knee, you must understand one thing:

It is not a major injury in the beginning, but it can and will be the injury that stops you from running permanently if you don’t address the underlying causes.

I have had Runner’s Knee just like you. It was around five years ago.

I was in my prime. 31 years old and the fittest I’ve ever been.

It was a slow progression. I began noticing my symptoms for about a week before I realized and then considered the consequences of my neglect.

What is Runner’s Knee?

Pain felt deep in the knee can be a symptom of Chondromalacia Patella, also known as Patellofemoral Pain Syndrome (PFPS). The meaning of chondromalacia can be broken down to chondro, meaning cartilage and malacia, which means weakening.

The underlying fact that this is a cartilage injury is what makes it the kind of injury that could ultimately keep you from running. Cartilage does not heal as well as bones and muscles do.

Once you lose it, you lose it. Although with some experimental techniques, regeneration of cartilage is looking more and more possible in the future.
Do you need your cartilage?

Yes, you do. It provides a slick surface for bones to glide on one another. That grinding feeling you have is from the cartilage not being there or it being too soft to do its job.

If you suffer from this condition, you are not alone. In fact, it is the most common reason any athlete will report to a sports injury clinic. It affects up to 30% of all athletes.

What are the symptoms of Runner’s Knee?

- Pain that is generally dull and constant
- Clicking/popping of the knee upon motion
- Swelling of the calf
- Bruising of the muscle
- Restricted motion
- Dull achy pain around the knee cap

What causes Runner’s Knee?

I hear “overuse” a lot.

I’m not going say that is 100% wrong, but I like to point out the obvious.

“Why does it only affect one of your knees, then?” you ask. “Don’t you run the same amount of steps with both legs?”

I am like everyone else. I too would like to think that I crushed so many miles this week, I just overused my body, but that is not the case.

Often after testing flexibility, core strength, hip strength, single leg balance and movement patterns like squatting and hip hinging, we find there are asymmetries.

Studies in the past blamed a weak vastus medialis or inner quad muscle, but recently we have learned there is more to it than just that.

You may be thinking it’s from a laterally tracking kneecap. Yes, that has been a theory as well, and yes, it can cause rubbing on the outer aspect of the femur bone, which creates damage, but the reason why it is “tracking laterally” is not the fault of the quad group.
It is the core and hip’s fault.

It’s true! You knee injury is from the core and hip once again!

Dynamic “motion” MRIs of patellofemoral pain syndrome patients have found that the main reason the kneecap rides laterally is because the femur bone spins itself into contact. The spinning starts at the hip.

If the core and hip muscles are not doing their jobs, the femur bone rotates medially (inward) and contacts the kneecap leading to patellofemoral pain syndrome.

**What does this mean for rehab?**

It means just like all of the other knee conditions, we need to focus on the core, hip and thigh.

I know this article is getting redundant, but it is true.

Here is a circuit I use with my runners rehabbing Runner’s Knee. Remember, this is all scalable. More importantly, keep in mind I prescribe this circuit to a person whom I’ve tested and deemed it’s safe for them to use.

Other rehab exercises we often use are:

- Proprioception exercises for the knee
- Deadlifts
- Multiplanar core stabilization
- Pallof press variations
What are some treatments used to decrease the pain of Runner’s Knee?

These are all great treatment options for decreasing knee pain while running. Without a drop in pain it is hard to rehab the area and use exercises.

• Rest and ice
• Addressing the scar tissue formation with soft tissue manipulation
• Active Release Technique and Graston
• Rehabilitative strengthening exercises
• Taping or bracing the knee
• Anti-inflammatory pain medications
• Surgery options of arthroscopy or realignment of osseous structures

To be clear, I do not agree with all of these, but they are used nonetheless.

Some image options that can assist in confirming the diagnosis are:

• X-rays – rules out bone injury
• MRI – way better image
• Diagnostic Ultrasound – can see the soft tissue of the knee
• Physical exam by a medical professional
PES ANSERINUS TENDONITIS

• Pain about an inch below the knee?
• On the front but inside?
• Pain climbing stairs?

This could be an injury to the Pes Anserine tendons or bursa.

What is Pes Anserine Bursitis?

The Pes Anserine is the attachment point for three muscles and in the area of a bursa located about an inch below the inner part of the knee. It is on the tibia bone.

The three muscles that attach here are:

• Gracilis
• Sartorius
• Semitendinosus (medial hamstring)

Pes Anserine pain is normally due to inflammation of the bursa at the location, but it can also be from the tendons...making it a tendonitis.

A bursa is a naturally occurring fluid filled sac designed to limit friction as soft tissue structures pass by an area.

Who gets Pes Anserine Bursitis?

Pes Anserine Bursitis is one of the less common running injuries, but it can happen. The more common injuries you will encounter are runner’s knee, meniscal injuries and tendonosis.

Pes Anserine Bursitis can be present in athletes such as runners, cyclists and triathletes. On the flip side, I have seen many normal sedentary people who have it as well.

How does Pes Anserine Bursitis happen?

It is no mystery there is a connection to the hip and core. All three of the muscles attaching to the Pes Anserine come from the hip.

Hip strength and endurance are directly connected to how well the core functions.

The core is the trunk as a whole...not just the six pack muscles.

Just like any other muscle/tendon injury, if you over stretch it, it goes beyond its optimal range. Think of a spring.
It has a length that it functions at best. Muscle and tendons are the same. When they are outside of these ranges, they are less effective at their job...so they become damaged.

Why is this important?

If the tendons become damaged, they also become inflamed. Inflammation creates a local chemical process, which then irritates the local bursa and leads to pain.

**How is Pes Anserine Bursitis treated?**

- Self massage of quads and hamstrings
- Active Release Techniques
- Graston or other tool assisted tissue work
- Stretching of the hip, thigh and ankle
- Deep tissue massage
- NSAID
- PRP
- Prolotherapy
- Rehab exercises for the core, hip, knee and ankle

**When can you start running again?**

It really depends on when you want to risk it.

In a perfect world, I would not have anyone run more than 5 miles at a time until they have successfully passed a battery of core and hip testing.

A decrease in pain has no correlation with if you can pass these tests or not. It just means that the area has calmed down. Simply resting it will calm it down, but that doesn’t mean your core, hips and knee are any more stable.

Pain can decrease within a matter of weeks, but building strength and endurance will take months to achieve.
PLICA SYNDROME

- Clicking on the inside of the kneecap?
- Small swelling in the area?
- Pain with running?

Plica Syndrome is a less common cause of knee pain in runners, but it is always on the list of possibilities.

It’s kind of funny this small tissue can create pain since it is not really a functioning part of our anatomy.

What is the Plica?

It is remnant tissue from our development. The main function of the plica is to provide glide for the knee joint.

Anatomically, the plica is thin layer of vascular synovial tissue found within the joint line of the knee.

The plica is remnant tissue from fetal development that is diminished in size; it also known as a synovial fold.

What is painful in Plica Syndrome?

The plica itself is inflamed and irritated. It can become caught during motion of the knee due to poor running gait or in certain movement patterns such as squatting. The plica can be more prominent in some than in others, which increases the likelihood of it becoming irritated more easily.

Remember, it is a remnant of our development. It should have gone away just like our tails did.

What does Plica Syndrome feel like?

- Dull and achy pain in at the inner (medial) knee joint that increases with activity
- Catching or clicking of the knee upon flexion and extension
- Swelling of the knee joint
- Restricted motion
- Pain going up and down stairs
- Pain with squatting, bending, or getting up from a chair
What else is Plica Syndrome misdiagnosed as?

- Meniscal tear
- Patellar tendinitis
- Stress fracture of the tibia

How can you treat Plica Syndrome?

- RICE (rest, ice, compress, elevate)
- Surgery based on the severity of the inflammation of the plica tissue
- Lidocaine injections
- Addressing the scar tissue formation
- Stretching
- Rehabilitative strengthening exercises

How to rehab Plica Syndrome

Rehab exercise is one of our focal points with Plica Syndrome treatment.

Normally, we focus on strengthening the entire kinetics chain, which includes:

- Core
- Hips
- Thigh
- Knee
- Ankle
- Foot

Sounds like everything in the leg, right? It is!

Leg and knee injuries are issues with the entire leg and core. Therefore, in rehab we can leave no stone unturned.
ACL (Anterior Cruciate Ligament) INJURIES

- Have you ever twisted your knee?
- Did it “pop”?
- Did it swell immediately?

You could have had an ACL injury in your past.

Why does the past matter?

An ACL injury is a huge predictor of future knee injuries for one reason…

Your knee is probably still “loose.”

The knee is intended to bend a lot in two motions: flexion and extension.

It is not intended to rotate and bend laterally.

**How does the knee stop itself from rotating and laterally bending?**

Bony architecture, ligaments, muscles and tendons help to keep the knee stable.

One of the larger contributors is the ACL.

**What is the ACL?**

The ACL, also known as the Anterior Cruciate Ligament, is one of four ligaments that allow your knee to function properly. It forms an “X” shape with another ligament in between the tibia and the femur.

The ACL is the ligament that prevents forward movement of the tibia from underneath the femur.

**Who gets ACL injuries?**

Females are at a higher risk of ACL knee injuries.

How much more? About ten times more!

Pretty unfair, huh?

You can prevent ACL injury and even rehab one if you do the right exercises. The American College of Sports Medicine claims significant improvements in knee control can be seen after just eight weeks of proper training.
What exercises are good for prevention and rehab?

ACL injury prevention programs must contain a few aspects:

- Core training
- Hip Strengthening (squatting and deadlifting)
- Hip Stretching
- Proprioception exercise for the hip and knee
- Single leg training (lunges, ½ one leg squats etc.)
- Landing plyometric training
- Acceleration, deceleration, change of direction training
- Knee rotational and lateral bend stabilization exercises

I know it sounds like a lot, but it’s not. If programmed properly, it can all be done in less than 30 minutes a day.

How many days a week should ACL prevention training be done?

I like three as the magic number, but here is the thing: once you stop, you will once again be at high risk of injury within about a month or so.

It’s not a scam; it’s the truth.

If you don’t use it, you lose it.

What if I already have an ACL tear…what can I do now?

If you have a tear and it has not been repaired, you will need to do a lot of the same work as someone who’s preventing an ACL injury, BUT you need to understand your knee is inherently unstable and very susceptible to swelling and injury.

I always suggest athletes with past ACL injuries have one on one instruction with a strength coach or a sports therapist.

Will you have to spend money?

Yes, but it is very much worth the cost!

References:


Still confused about knee pain? I designed an online course mirroring how we correct knee pain at my office. It’s packed full of videos on rehab exercises, education, and has a 100% money back promise from me if you don’t find any value in it at all. Here is the link!