

# Baseball Brains

Tips and advice for a better  
way to coach and play baseball



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*The **Baseball Brains Pitching Academy** Is Proud To Present:*

## **Common Mechanical Issues And How To Fix Them**

This series of eBooks is designed to address the most common mechanical issues or physical inefficiencies that we see in pitchers of any age.

The first section of these eBooks will be focused on educating the player and coach about what the problem actually is, and what it looks like. Armed with this information, it is our hope that coaches and players will be able to analyze video and determine whether or not these issues exist in the mechanical aspects of the pitching motion they are viewing.

The second part will be about how to fix the issue. We don't find information in and of itself to be very helpful for coaches and players, if they're not given the tools to fix something that may be wrong. While there is never a "one size fits all" answer to mechanical issues in the pitching motion, we will do our very best to give the reader several different ways that we have had success with in attempting to address any particular problem.

While some mechanical issues make injury or soreness more likely in an athlete, we never say that any one of these, or a combination of all of them, will cause or guarantee an injury. There are just far too many variables and individual considerations to factor in to make such a statement. We are not "injury predictors" and we don't say that you have to follow our advice or you'll end up having Tommy John surgery. We simply believe that strong science, thousands of hours of slow motion video analysis, and decades of personal experience, shows us that there are movement patterns and sequences that are more healthy and some that are less. We feel it is our job to teach athletes how to perform at their highest possible level, while remaining as healthy as humanly possible.

While it's true that none of these traits guarantee an injury, it's also inaccurate to say that being void of all of these issues means a pitcher won't get hurt. There are huge amounts of stress being placed on a pitcher's arm and body when he delivers baseballs from a mound, and no amount of mechanical training can fully eliminate the risk of injury. We recommend engaging in a thorough and well researched warm up routine, fitness protocol (year round), and in proper recovery activities. While the Baseball Brains Pitching Academy will continue to work on all of the above for our members to read, there are many great resources out there and we encourage you to research often and become the most well rounded athlete or coach you can be.

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## Part 3: Lead Leg Instability

### What is Lead Leg Instability?

There are two primary aspects of lead leg instability that we'll examine here:

- Flexion in the knee of the pitcher's lead leg increases between weight bearing foot plant and delivery of the ball.
- The leg “wobbles” or moves left or right as it begins to bear weight and block force.

Pitchers land in many different ways in terms of knee flexion. Some will land on a mostly straight leg and others land on a leg that is much more bent.

Notice in the pictures below the difference between Justin Verlander and Roy Oswalt:



The angle of knee flexion on weight bearing foot plant is almost 20 degrees different between these two elite pitchers. High level pitchers will land at many points on this spectrum and that's just fine. What matters most is that the knee angle they land in remains the same or extends. Using the same two pitchers we started with, look at the knee angles upon release:

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We can see that between the time of weight bearing foot plant and release, Justin Verlander extended his knee to almost perfectly straight. In fact, just after release his knee is totally straight by any measure. Roy Oswalt on the other hand did not significantly extend at all, but instead remained the same.



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This is key, that flexion in the knee does not continue into release. It is not crucial that the knee extends, though many hard throwers possess this trait. Here is another example of the leg extending after foot plant:



It is critical however, that the knee is solid and able to brace the body's movement forward. If the knees allowed to “drift” the body loses a great deal of force and momentum, and the pitcher will lose velocity and mechanical efficiency.

Here are a few more pitchers at foot plant and release:



Zack Greinke

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**Felix Hernandez**

In summary of the first point, the knee flexing further as the pitcher goes from weight bearing foot plant to release of the ball is lead leg instability.

Another way the lead leg can exhibit instability is if the knee goes inward between weight bearing foot plant and release, or outward. The knee moving inward is very uncommon, however the knee moving outward is anything but uncommon.

Typically seen in youth pitchers, the knee moving outward from the body (glove side) can cause the knee to flex resulting in the problems outlined above. The other ill effect this movement can cause is a misdirection of the body. The front leg is the primary stabilizer for the body once it begins to bear the pitcher's weight, so any movement left or right will cause the same to happen in the upper body.

## **What Causes Lead Leg Instability?**

There are a few primary contributors to lead leg instability:

- Lack of strength in the legs, gluteals, and core.
- Insufficient coordination in lower half.
- Lack of body awareness.
- Improper throwing mechanics

### **STRENGTH**

The first factor in lead leg instability is strength. We see a lot of youth pitchers who exhibit one of the two signs of instability in the front leg, and many times it can be attributed to a lack of strength.

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Young kids in particular haven't engaged in a whole lot of strength training yet (that's a good thing mostly), and the front leg is asked to stabilize an amount of weight during the pitch that's roughly 125% of their body weight on the mound. Those two things don't add up very well, and we're left with a front leg that cannot bear the weight. The result is that the knee flexes, the leg drifts, and the body is left sitting on top of a moving and weak base.

The strength issue is not limited to youth baseball players, there are pitchers of all shapes and sizes (and ages) who don't have a front leg that's strong enough. The causes of this will be explained later in this eBook, however it's safe to say for now that training programs are often to blame. Sometimes important muscle groups are forgotten or ignored, and other times the programming doesn't incorporate enough specificity to pitching.

## COORDINATION

Coordination comes in many different forms depending on how and why the word is being used. The first meaning of coordination could be simply that a young kid hasn't gained the physical maturity and motor coordination that he will have later in life. In this case, it's important to note as a coach or athlete that biology will fill some of the gaps and the problem may not be a problem.

In other cases, a lack of true coordination can be caused by a lack of true coordination **training**. We will discuss this later in the “how to fix” section as well, as we see many strength and conditioning programs designed by good coaches which have almost no coordination component. It's our belief that this is absolutely critical training for any athlete, especially a pitcher.

## AWARENESS

Just like the other causes discussed above, body awareness is also multifaceted. First, body awareness can also be a natural component of a human being as we become older and better programmed to move. While this is not necessarily “trainable” it can be accelerated by general fitness training and specific drills discussed later.

Body awareness also has a piece that is very trainable. It is simply teaching the body how to use what it has just learned. In other words, the coach just said that the pitcher needs to have a firm front leg. The pitcher is now aware of the words, aware of what the coach wants, and perhaps even aware of what it looks like if the coach showed him pictures or video. What the pitcher lacks in many situations however, is the physical awareness to know if he's doing it or not. Teaching body awareness is much about *feel*, about teaching the athlete's body *what it feels like* to move correctly.

## MECHANICS

While we examine the lead leg as a mechanic in and of itself, there are other throwing mechanics that

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can lead to a lead leg having a harder time stabilizing.

The first is what we call a “linear” throwing style. This is discussed further in other Pitching Academy documents, but essentially this is less rotational and more “straight line” into and after release of the ball. Pitchers who are attempting to land in a fielding position almost always throw this way. Much of the pitcher's weight is going straight toward the catcher through release, which puts a lot of forward pressure on the front leg. More on this in the “how to fix” section.

Other mechanics have detrimental effects on the lead leg as well, such as over or under striding, striding in the wrong direction, or landing with the foot misaligned. We discussed earlier how one form of lead leg instability is if the knee leaks outward as the pitcher throws. One of the leading causes of this is the landing foot landing in a “pointed out” orientation. If the foot lands pointed away from the body, there is nowhere else for the knee to go as the body pushes its weight onto it. It will try to follow the foot, and if it's pointed outward, it'll go that way.

## Why is Lead Leg Instability A Problem?

First the bad news; lead leg instability is a huge problem if it exists. While pitchers can throw alright while exhibiting this mechanical fault, it will put a very low ceiling on their potential.

The front leg is the “brace” that turns forward momentum into rotational power in the throw. This is almost exactly the same as hitting, in that rotation is where all of our power comes from and in order to rotate we have to have something to rotate *against*.

One of the analogies that we use a lot to describe how important this bracing action is, is to have the pitcher imagine that he's wearing a roller skate on his front foot. He would do fine into the leg lift, his stride would be great, but it would all fall apart once his front foot began to bear weight. The catastrophe that follows in the imagination is happening in much smaller ways every time the lead leg collapses or leaks in any direction.

If a hitter was stepping into sand with his front leg, could he swing very hard? If a pitcher was landing in a sand pit, how hard could he throw? The answer is obvious, and it's because those athletes are losing their brace just as they need to rotate powerfully. Both hitting and pitching are linear-to-rotational movements, meaning they both start as a forward move toward the target and then they turn into a powerful rotation once the front leg bears weight.

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If the front leg is mushy or drifts forward, a whole host of issues can arise in the upper body. Studies have shown that every inch the knee moves forward after foot plant costs the pitcher 1-3 miles per hour. We personally have confirmed similar numbers, and we've even seen players experience larger gains. The loss of velocity is not nearly the only problem associated with a weak base, but it is perhaps the most significant.

Here are two 17 year old pitchers close to release, with their knee location at weight bearing foot plant marked with an orange line:



Notice how far the knee has drifted forward into release, almost three inches with the first pitcher. We were able to eliminate much of this drift with the first pitcher and add a lot of miles per hour. While lead leg stability was not the only issue he had, fixing it causes many other issues to clean up as well. Again, pitching on a flimsy base is very difficult and often the best thing a coach or player can do to begin training, is firm it up.

The other problem caused by an unstable lead leg is when the knee and leg move in or out and “guide” the body and arm off course. This is honestly one of the biggest issues that we've found with young kids in relation to consistent accuracy. The most common issue is the leg bending or drifting to the glove side, which steers the body to that side and effects a multitude of arm action and shoulder rotation mechanics.

A young pitcher that is landing on a leg that is unstable is going to find it nearly impossible to throw the ball where they want it consistently. Besides strength and the other issues listed above in this eBook, this is often caused by pitchers striding too open or landing on a foot that is pointed to the glove side.

So that's the bad news, however the good news is that lead leg stability is fairly simple to train. It's also good news that this is not an “all or nothing” scenario, even a small degree of improvement will have positive effects on the delivery. Lead leg stability training is one of the biggest “bang for your buck” mechanics to improve if there are any issues to begin with.



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## How to Fix Lead Leg Instability

When it comes to fixing lead leg instability, it's a good idea to take a multi-pronged approach. Let's quickly review the causes:

- **STRENGTH:** This should probably be worked on with all baseball players, so even if the root cause of a pitcher's lead leg instability is something other than strength, this is a good area to train. Strength of what? The primary muscles involved in stabilizing the leg after it bears weight are: Calf, Hamstring, and Quads. We would call those the “tier one” muscles of front leg stability, with Glutes and Core as the secondary focus.

Exercises to improve strength (These are discussed at great length in other Pitching Academy eBooks):

1. **Squats:** We are huge believers in multi-joint lifts which require groups of muscles to act together in a synchronized action to perform the work. Squats do this beautifully and they teach the body how to move powerfully and under control if done correctly.
2. **Deadlift:** The deadlift is awesome for strengthening the exact muscles we're targeting for baseball and should be a staple in any program.
3. **Single Leg Squat:** Single leg squats are very different from typical squats and should be part of any baseball routine. Baseball players do a lot of work on one leg at a time, and strengthening them individually does a lot more than just make them stronger, it improves coordination, awareness, and unilateral stability as well.
4. **Lunges:** These are fantastic for lead leg stability because the athlete is mimicking the pressure that is trying to “push” the knee into flexion, and the lunge action is resisting it.
5. **Side Slides:** Or side lunges, these are good for lateral hips and quad strength. Like many of these listed exercises, these don't require anything more than body weight to perform.

One way to do single leg squats:



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**An important note on these strength exercises:** Technique is critical with all lifts, especially when the back is involved as it is in squats and deadlifts. Poor technique will minimize results and expose the athlete to serious injury.

We encourage baseball players to use a safety or cambered bar when performing back squats to protect the arms. Please consult the many great resources online or our other Pitching Academy eBooks on this subject to learn how to perform these and other exercises, and always put safety first.

- **COORDINATION:** This can be programmed directly into the strength routine for the athlete. A lot of coaches work on back leg balance in drill work but not front leg and this should change. A couple of our favorite exercises for coordination are “skaters” and “airplanes”:

The Airplane starts here:



The athlete then lowers his right arm to the ground while maintaining balance, returns to neutral, and lowers to the other side. This is a great balance and stability drill and can be incorporated into any warm up or workout routine.

Skaters:

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The athlete will move from A to B in a good rhythm and **STABILIZE** on his foot before moving to the next position. He may mix in quick hops back and forth, but for our purposes here he should stay on each foot for a count or two to provide additional stabilization training.

Another couple great tools we use to improve coordination are agility ladders and hurdles. Mixing up the routines on both of those devices will require a mental component that will help the athlete connect to the proper movement patterns. More on these in other Pitching Academy eBooks.

- **AWARENESS:** Awareness is similar to coordination in the context of training, so developing strength and performing the exercises above will certainly help. Going back to what we said earlier about awareness, it's mostly about feel. The athlete needs to feel that front leg bracing, so as long as the programmer knows that, there is a lot of freedom to add elements of awareness and feel to many common workouts the athlete may already be doing.

One of the primary things we like to do for this, besides what we've said already, is medicine ball throws. Again, at the end of these throws, we will add a “stabilizer”. This just means that the throw will take place, and the athlete must attempt to stabilize on the lead leg after the throw. This adds awareness of what it takes to stabilize in motion. The throws that we make are outlined in depth in other Pitching Academy documents, but keep it simple and use many variations to enhance the training.

- **MECHANICS:** We won't get consumed with mechanics here because we believe that the primary issues related to lead leg instability are those we've already mentioned. In fact, we believe that a great deal of “mechanical” issues could be cleaned up with strength and mobility training. This is the horse in the “horse and cart” metaphor, and mechanics are the cart. We've

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got to create young baseball players who place **body training** before pitching training.

Having said that, there are a few mechanics that we can look at here that will improve lead leg stability. The first is making sure the pitcher is striding in a good line. If the lead leg or foot is landing open, that needs to be corrected very quickly.

Improving momentum and speed toward home often goes far toward straightening the stride and landing foot. Increasing athleticism on the mound also helps, equating pitching to playing shortstop for example. Rhythm, speed, strength, tempo; these things usually help pitchers stride to the target properly. Much more so than balance, stop and go, and pitch-by steps approaches.

The last mechanical item we'll touch on here is the linear vs. rotational component. Briefly stated, we want to deliver the ball with powerful rotation and allow a natural follow through. The easiest way to work on this is to train shoulder replacement. To start, the front shoulder is pointed at the target and to finish the throwing shoulder is at the target. Full shoulder

replacement enhances core involvement and torso strength. The action also lessens the weight that's pushing straight forward, so our body can rotate powerfully around the front hip and over the front leg.

The last great tool we'll leave you with is the TAP stability pad that is awesome for doing a lot of these exercises with, click below to check them out:



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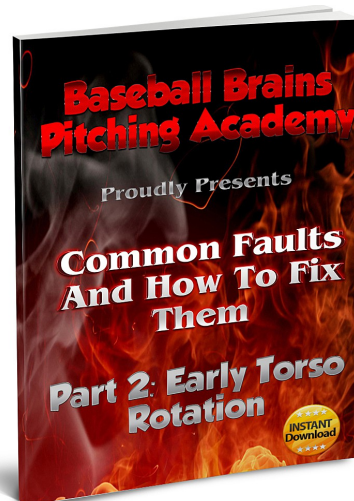
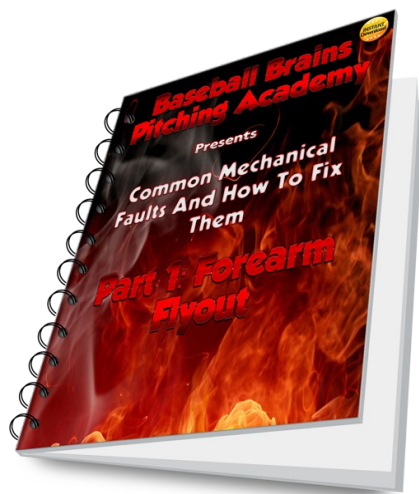
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To see if you or a pitcher you know has this or any other of the common mechanical problems, please send us a video and we'll check it out for FREE as a thank you for buying this eBook! Just send the video (or a link to where we can see it) to [baseballbrains.net@gmail.com](mailto:baseballbrains.net@gmail.com) and we'll do a free consultation!

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**Thank You!**