



GROUND CONNECTION AND WHERE IT GETS LOST

# Losing the *Ground*

There is one interface between a pitcher and everything he is trying to do, and it is about the size of a shoe. Lose contact with it early, point the force the wrong way, or get the body ahead of it, and nothing above the ankle can recover what was never produced.

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A pitcher cannot generate force. He can only **borrow it from the ground** and only while he is touching it.

Which makes the drive phase a rental agreement with two terms: how hard he presses, and how long he keeps pressing. Most of what gets called a lower half problem is one of those two terms being cut short, and the causes are spread across the ankle, the hip, the pelvis and the timing rather than concentrated anywhere you would naturally look. The ankle gets blamed least and is responsible most.

# The physics, in one line

## Force multiplied by time, pointed at the plate

Speed toward the target comes from force applied against the ground **over time**, in the direction you want to go. Three terms, all of them losable independently:

**Force** — how hard he can press, which is capacity. **Time** — how long the foot stays loaded, which is mostly ankle range and timing. **Direction** — whether the press goes toward the plate or toward the sky, which is hip and knee organisation.

A pitcher can be strong, keep the foot down a long time, and still get nothing because it all went vertical. Another can point it perfectly and lose half of it by coming off the rubber early. The three terms do not substitute for each other, which is why the causes below have to be worked separately.

# Connected, or not

## CONNECTED

### The body accelerates over a foot that is still pressing

The centre of mass travels toward the plate while the back foot keeps applying force behind it. The shin travels forward over the ankle, the heel stays down late, the hip loads and extends, and the toe leaves last.

The force vector points at the target. Ground contact ends when there is nothing left to give, not before.

## DISCONNECTED

### The body leaves and the foot stops contributing

The centre of mass gets ahead of what the foot can still push against. Contact continues but production has stopped, or the heel lifted early and contact itself ended.

What replaces it is falling. The athlete still arrives at foot contact, just with momentum he was given by gravity rather than momentum he built, and the block has less to convert.

# Every way the connection gets lost

Grouped by which of the three terms it costs. Most athletes have one from group A and one from group C.

## A · Ankle and foot — costs time

The most commonly responsible and least commonly examined. Everything here shortens how long the foot can stay loaded.

- 01 **Limited ankle dorsiflexion.** The shin has to travel forward over the foot while the heel stays down. When it cannot, the heel lifts to let the body past, and contact ends early. The single highest yield thing on this list, and it takes ten seconds to test.
- 02 **Weak or short calf.** The deep calf controls the shin travelling forward and then pushes. Without the strength to hold that lengthened position under load, the ankle gives up the range it has.
- 03 **Arch collapse.** The deep arch muscle and the muscles on the outside of the shin hold the foot as a stable base. When the arch flattens, force dissipates into the foot deforming instead of travelling up the leg.
- 04 **Weak small foot muscles.** The intrinsic muscles hold the arch under load. Frequently the reason an arch collapses in an athlete whose calf and shin test fine.
- 05 **Limited big toe extension.** The last thing in contact. Without range there, the final portion of the push cannot happen and the foot leaves before it is finished.
- 06 **Poor rubber or mound contact.** Worn spikes, a chewed up landing area, an unfamiliar mound. Practical, real, and worth ruling out before a training intervention.

## B · The pelvis gets ahead — costs force and time

The pushy pelvis. The body leaves before the leg has finished pushing, so contact continues while production does not.

- 07 **The pelvis leads instead of the hip loading.** Rather than sinking into the back hip and driving, the athlete sends the pelvis toward the plate first. The centre of mass moves out beyond the base of support and there is nothing left to press against.
- 08 **Falling rather than pushing.** The distinction that matters: a controlled forward loss of balance can be legitimate, but only while the foot is still applying force behind it. When the fall is the only source of momentum, contact has become decorative.
- 09 **Hip hiking instead of shifting.** The pelvis gets lifted on the free side rather than the body shifting over the drive leg. Nothing loads, so there is nothing to unload, and the weight never arrives over the foot at all.
- 10 **Rushing.** Force takes time to develop, and reaching peak force takes longer than most of the drive phase lasts. An athlete who hurries the early phase leaves force he had the capacity to produce.

## C · Hip — costs force and direction

Where the push gets pointed, and whether there was anything loaded to push with.

- 11 **Limited back hip rotation.** Without range to rotate around the loaded leg, the pelvis opens early and takes the drive with it. The push finishes before the body is in position to use it.
- 12 **Limited hip flexion or a poor hinge.** If he cannot sit into the hip, he cannot load the glutes and adductors, and the drive has to come from the knee instead.
- 13 **Weak side hip.** The pelvis drops or hikes in single leg stance, the knee caves, and force leaks sideways out of a leg that was supposed to be a post.
- 14 **Quad dominant knee extension.** The direction failure. The knee straightens early and drives the body **up** rather than out. Vertical force does not become ball speed, it becomes airtime that has to be paid back.
- 15 **Weak glutes and adductors.** The big inner thigh muscle is a major and undercredited hip extender in the drive. Without it and the glutes, the quad takes over and points everything vertically.

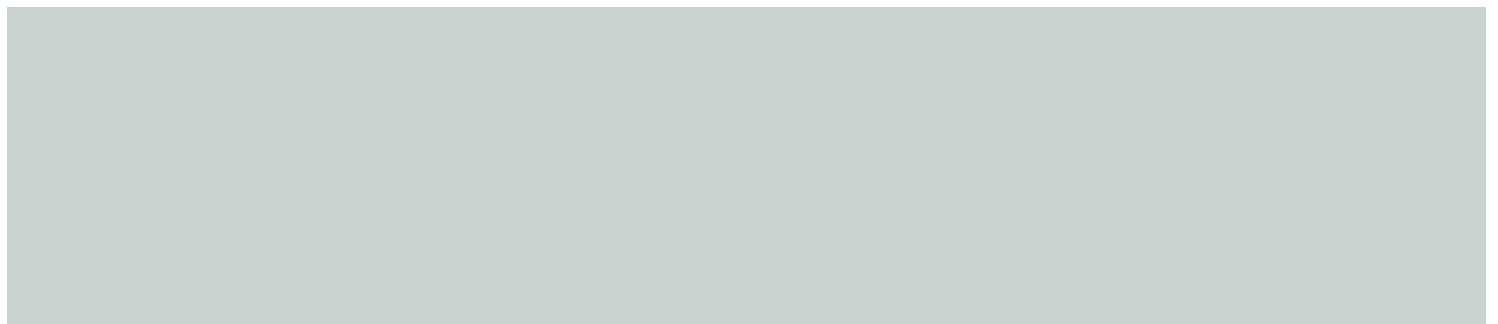
## D · Capacity and state — costs everything, temporarily

Not mechanical faults. They change what the athlete can do on a given day.

- 16 **Fatigue.** Rate of force production degrades before maximum force does, and the drive phase runs on rate. The connection is one of the first things to go across an outing, which is why the lower half quiets down before the arm does.
- 17 **Balance and proprioception.** Staying over one leg while accelerating is a skill. An athlete who cannot hold single leg stance under fatigue will leave the ground early to escape the position.
- 18 **Guarding after a lower body injury.** Ankle, knee, groin or hip. The nervous system limits loading on a leg it does not trust, and the drive shortens without any decision being made.
- 19 **Being told to push.** The cue itself. Asking an athlete to push off usually produces conscious quad driven knee extension, which is cause fourteen delivered on request.

## What it looks like

Film from the side for the ankle and from behind for everything else.



|                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                 |                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>SIDE VIEW</b></p> <p><b>The heel pops early</b></p> <p>Watch the back heel against the rubber. Leaving well before the front foot lands means the shin could not travel over the ankle and contact was cut short.</p>                                                                                                                 | <p><b>SIDE VIEW</b></p> <p><b>He rises at the top</b></p> <p>Head and belt line moving up rather than out. The push went vertical, which turns force into airtime rather than into speed toward the plate.</p>  | <p><b>SIDE VIEW</b></p> <p><b>The pelvis is out past the foot</b></p> <p>Draw a line up from the back foot. If the hips are well beyond it while the leg is still supposedly driving, he is falling rather than pushing.</p> |
| <p><b>BEHIND</b></p> <p><b>The arch flattens or the ankle rolls in</b></p> <p>The base deforming under load. Force spent bending a foot is force that never reached the pelvis.</p>                                                                                                                                                         | <p><b>BEHIND</b></p> <p><b>The back knee caves</b></p> <p>Frontal plane leak. The hip cannot hold the leg in line, so part of the push goes sideways.</p>                                                       | <p><b>BEHIND</b></p> <p><b>The belt line tilts up on the lift side</b></p> <p>A hike rather than a shift. The weight never arrived over the drive leg, so there was nothing loaded to push with.</p>                         |
| <p><b>ANY ANGLE</b></p> <p><b>Stride comes up short</b></p> <p>The clearest downstream symptom. Stride length is the best supported lower body velocity predictor there is, worth roughly 0.7 mph per one percent of height in a study of 39 high school and college pitchers, and a short one usually means the drive did not produce.</p> | <p><b>LATE INNINGS</b></p> <p><b>All of it, worse</b></p> <p>Compare inning one to inning five on the same camera. The connection degrades before the arm does, and the arm starts covering the difference.</p> |                                                                                                                                                                                                                              |

## Screening it

Ten minutes, and the first test is the one most likely to change the plan.

| WHAT TO TEST AND WHAT IT POINTS AT          |                                               |                                                                                                         |
|---------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------|
| TEST                                        | FLAG IF                                       | WHAT IT MEANS                                                                                           |
| <b>Knee to wall ankle test</b> , both sides | Under about four inches, or a side difference | Group A. Start here every time. The cheapest test on the list and the most often responsible.           |
| <b>Single leg heel raise to failure</b>     | Low count, or asymmetric                      | Calf endurance, which is what holds the lengthened position under load rather than giving up the range. |

| TEST                                                           | FLAG IF                                              | WHAT IT MEANS                                                                                                            |
|----------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Arch under single leg load</b>                              | Visible flattening or the ankle rolling in           | The base deforming. Points at the deep arch muscle, the outside of the shin, and the small foot muscles.                 |
| <b>Big toe extension range</b>                                 | Limited                                              | The last portion of the push. Rarely checked, occasionally the whole answer.                                             |
| <b>Single leg stance</b> , thirty seconds, then repeated tired | Pelvis drops or hikes                                | Group C and the hiking version in group B. Passing fresh and failing tired matches what the video shows late in outings. |
| <b>Back hip rotation</b> , both directions                     | Five degrees or more asymmetry inward                | Group C, and a finding with a published injury association rather than just a mechanical one.                            |
| <b>Hip hinge quality</b>                                       | Cannot load the hamstring without using the low back | Whether he can sit into the hip at all, which decides whether the drive comes from the hip or the knee.                  |
| <b>Single leg broad jump</b> , distance against height         | Jumps up rather than out                             | The direction term, measured. An athlete who cannot point force horizontally in a jump will not do it on a mound.        |
| <b>Lateral bound</b> , distance and time to re contact         | Short, or slow to leave the ground again             | Horizontal force production and the ability to absorb and return it, which is the closest field proxy for the drive.     |

## Fixing it, in order

Range before strength, strength before direction, direction before drills. Skipping to drills is the common route and the least effective.

### STAGE 1

#### Give the ankle its range back

If the shin cannot travel over the foot, the heel will keep lifting early no matter what else changes. Nothing downstream is worth doing first.

- **Knee to wall mobilisation** and calf length work, then reassess the same day
- **Big toe extension** work if the range is short there
- Do not stop at range. Mobility that is not loaded is gone inside a week

### STAGE 2

#### Make the foot and calf hold it under load

Range plus the strength to keep the heel down while the body travels past. This is what turns a mobility gain into extra contact time.

- **Heavy calf raises**, straight leg and bent knee, with three to four seconds on the lowering phase
- **Seated calf raise**, heavy, for the deep calf specifically, since the knee is bent in the drive
- **Tibialis raises** for the front of the shin, which controls how fast the shin travels
- **Short foot and toe splay work** for the small foot muscles holding the arch

## STAGE 3

## Load the hip so the knee stops volunteering

The direction term. A hip that can carry the load points the push at the plate. A hip that cannot hands the job to the quad, which points it at the sky.

- **Trap bar deadlift and Romanian deadlift** to build the hinge before the push
- **Rear foot elevated split squat**, heavy, for single leg capacity
- **Banded hip abduction and Copenhagen planks** for the frontal plane leak
- **Back hip rotation work**, restored then loaded, if the range is short

## STAGE 4

## Point it horizontally

Force that goes up is wasted regardless of how much of it there is. This is trained with direction specific work, not with more strength.

- **Heavy sled marches and lateral sled drags**, which force long ground contact and a horizontal vector
- **Skater bounds and lateral bounds** for reactive horizontal force
- **Broad jumps** rather than vertical jumps, so distance is the feedback
- Cue it sideways rather than downward. Clawing or pulling the rubber back toward second recruits the glutes and hamstrings, where pushing off recruits the quad

## STAGE 5

## Change the task, not the cue

Two of the nineteen causes came from instruction. Adding instruction is unlikely to be the fix, and asking him to push produces the exact fault you are trying to remove.

- **Step back roll ins, step back windups, the rocker drill**, which reverse the pattern without anyone naming it
- **Do not cue pushing.** It reliably produces quad driven knee extension
- Recheck stride length as a share of height. It is the cleanest downstream measure of whether the drive improved

## When a short ground phase is not a fault

### Some athletes are built to leave early

An aerial type generates by rebounding rather than by pushing: weight forward on the feet, fast leg lift with no pause, very little back knee bend, and a controlled forward loss of balance that is the mechanism rather than a mistake. His drive phase is genuinely shorter and that is not a leak.

The distinction is whether the foot was still **producing** during the contact he had. A rebound is short and productive. A lost connection is short and empty, or long and empty. Judge it by stride length, by whether the force went horizontally, and by whether he arrives at foot contact with momentum he built rather than momentum gravity gave him.

Practical version: if the ankle screens clean, the hip screens clean, the stride is normal for his height and the block is good, a short drive phase is his engine. Chasing a longer one buys nothing and can cost him the rebound he throws with.

## Where this sits in the library

### This is the first link, and it is upstream of everything

Group B overlaps directly with *False Load*, which covers the hiking version in full. Group C shares screens with *Swing or Rotate*. The rebound exception is *Spring or Sink*. And the consequence of a drive that never produced is the whole rest of the chain: less momentum to convert at the block, less rotation for the chest, less to leave the arm behind with.

Which is why a pitcher with an arm complaint and a clean shoulder screen is often an ankle problem four links away. **The ground is where the delivery starts, and it is the last place anyone looks.**

## Sources

- Tread Athletics — Problem Solving Your Lower Half Pitching Mechanics, vertical against horizontal drive
- The Effect of Trunk and Lower Body Mechanics on Fastball Velocity, SportRxiv, stride length and velocity
- Lumbopelvic-hip Control, Upper Extremity Joint Moments, and Drive Leg Ground Reaction Force in Adolescent Pitchers
- Decreased Hip Internal Rotation Increases the Risk of Back and Abdominal Muscle Injuries, 258 player seasons

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- [Gluteus Medius and Scapula Muscle Activations in Youth Baseball Pitchers](#)
  - [Driveline — Making Movement Changes in the Weight Room](#)
  - [Driveline — A Different Model for Cueing Pitching Mechanics, constraints rather than cues](#)
  - [NSCA — CSCS program design, rate of force development and horizontal force](#)
  - [Manifestations of muscle fatigue in baseball pitchers: a systematic review](#)
  - [ActionTypes — Aerial and terrestrial pitchers](#)
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Check the ankle first. It is ten seconds, it is the most common cause, and it is four links away from where the complaint usually shows up.