

FRONT HIP · ROTATION & THE BLOCK

Swing or *Rotate*?

What a front hip that can't rotate does to the rest of the delivery — why the lead leg ends up swinging the pelvis open instead of anchoring it, why the back leg gets dragged through early, and what it takes to turn the front hip back into an axle.

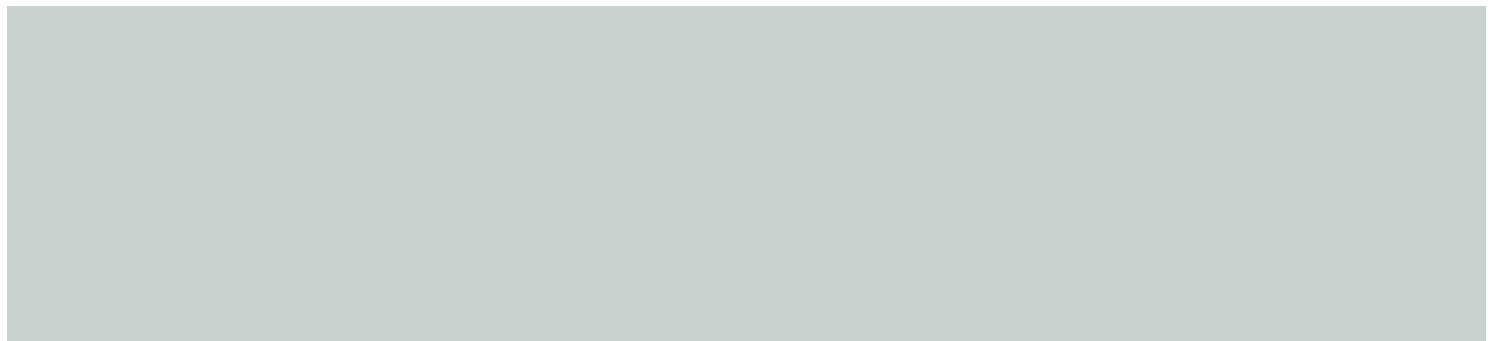
OUTLIER PERFORMANCE LAB COMPANION TO “DEFICIENCY OR ADAPTATION”

The front hip is supposed to be an **axle**. When it can't rotate, it becomes a **lever** — and the whole delivery inverts: instead of the pelvis rotating around a planted leg, the leg swings the pelvis open.

Everything downstream is a consequence of that one substitution. The back leg comes through early because there's nothing anchoring the front side. Separation collapses because the pelvis opens before the chest has anything to separate from. Nothing brakes the pelvis, so the chest never gets accelerated. And the arm — which is the only thing left with a job — makes up the difference.

The same four moments, two different outcomes

Freeze these four frames on any delivery. The fork happens at foot contact, and everything after it is already decided.



Late stride BEFORE CONTACT	WHAT SHOULD HAPPEN The back hip holds counter rotation and the pelvis stays closed. The lead leg travels out in front, flexed and abducted, but it is <i>reaching</i> — it isn't turning anything yet. Separation is being built here, and it's held by the back hip, not created by the front one.	WHAT HAPPENS INSTEAD Often looks fine. This is why the fault gets missed — the stride phase can be clean and the problem still shows up a frame later. Occasional early tell: the pelvis is already leaking open as the leg travels, because the athlete is turning early to buy range he knows he won't have.
Foot contact THE FORK	WHAT SHOULD HAPPEN The foot plants and the front hip accepts the rotational load. From this instant the hip stops being a leg and becomes a fixed point for the pelvis to turn around. This is the moment that demands rotational range. Not strength yet — range.	WHAT HAPPENS INSTEAD The foot plants and the hip has nothing to give. The joint is already at the end of its rotational range before the pelvis has turned at all. The body still intends to rotate. It just has to find another way.
Rotation CONTACT → RELEASE	WHAT SHOULD HAPPEN The pelvis rotates around the planted femur. The back hip drives and travels around the front side. Critically, the back leg is <i>carried</i> by the pelvis — it is a passenger, not the engine. The front hip is absorbing and controlling the whole time, which is eccentric work, not a stretch.	WHAT HAPPENS INSTEAD The pelvis can't rotate around the femur, so it rotates the femur instead. The leg swings. You'll often see the foot pivot or the knee track laterally as the whole limb turns. With the front side unanchored, the back leg gets pulled through early to supply the rotation the hip refused. The passenger becomes the driver.
The block RELEASE	WHAT SHOULD HAPPEN The hip arrives at end range, the knee extends hard, and the pelvis decelerates against a fixed point. Braking the pelvis is what spikes chest rotation speed — the energy has somewhere to go. Reference: front knee straightening at roughly 350°/s from contact to release.	WHAT HAPPENS INSTEAD There is nothing to block against. The hip never became a fixed point, so the pelvis has no wall to hit and simply keeps turning until it runs out. The chest never gets the handoff. Below about 242°/s of knee extension reads as a failed block.

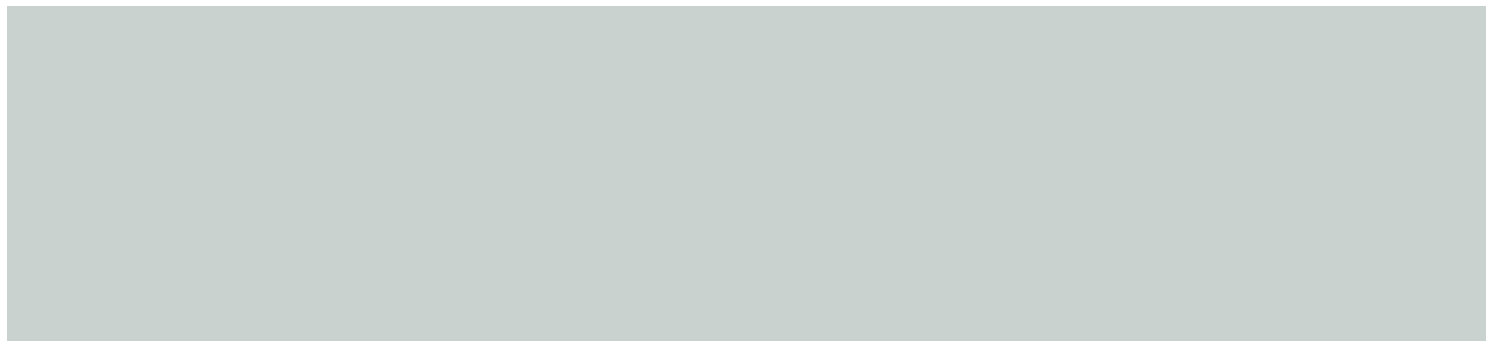
The cascade, in order

Each step causes the next. This is why fixing the fifth thing you notice never works — they're all one problem wearing different costumes.

01	Foot lands. The front hip has no rotational range left to give.
02	The pelvis can't turn around the femur, so it turns the femur — the leg swings instead of anchoring.
03	With no anchor on the front side, the pelvis opens early and keeps going. There is no axle to rotate about.
04	The back leg is pulled through early to supply the rotation the front hip wouldn't. What should have been carried is now doing the work.
05	Separation collapses. Hips and chest arrive square at the same moment, so the trunk has nothing to accelerate against.
06	Nothing brakes the pelvis, so trunk rotation speed never spikes. The whip loses the link that was supposed to crack it.
07	The lumbar spine — which has roughly 13° of rotation in total — is asked to supply what the hip didn't. This is where oblique and low back strains come from.
08	The arm is the last segment with a job left, so it generates what it should have been handed. Elbow load rises and the velocity doesn't follow.

What it looks like on video

No single one of these is diagnostic. Three or four together, plus a failed rotation screen, is the pattern.



BACK SIDE The back leg comes through early The clearest tell. The back foot releases and the leg swings around before the chest has rotated. It's being used to turn the pelvis rather than being carried by it.	FRONT FOOT The foot spins or the toe rotates after landing The whole limb is turning because the joint won't. Look at the spikes — a foot that reorients on the dirt after contact is a leg doing a hip's job.	FRONT KNEE The knee tracks out and away Instead of staying stacked over the foot while the pelvis turns above it, the knee drifts laterally with the swinging leg.
TIMING Hips and chest square up together The separation number can look acceptable at foot contact and still vanish immediately. Watch the two segments arrive, not just the peak value.	FRONT HIP The hip drifts toward the plate An axle stays put. If the hip keeps translating after contact, energy stays linear and never becomes rotation.	FINISH He falls off toward the glove side With no block, momentum has to go somewhere. It carries him off the line rather than up and over the front leg.
FATIGUE It gets worse late Rotational control is glute work. As the hip fatigues across an outing, the swing pattern deepens — which is also when tissue is least able to tolerate it.	COMPENSATION The front foot lands open Frequently a preemptive fix: he turns the foot out at landing to borrow range the hip doesn't have. Treat this as evidence, not as the fault itself.	

What it costs

Three separate bills, and they don't arrive at the same time. The velocity bill is immediate; the tissue bill accumulates.

THE THREE CURRENCIES		
CURRENCY	MECHANISM	WHAT TO MEASURE
Velocity	The block is what converts forward momentum into rotation. Stopping the pelvis against a fixed front leg is what makes the chest turn fast. No anchor, no conversion — the speed stays linear and gets spent going forward instead of around.	Front knee straightening speed , contact to release. Target around $350^{\circ}/s$; under $242^{\circ}/s$ reads as a failed block.
Command	Foot contact is the firing point — the last stable frame before everything spins. A hip that swings differently pitch to pitch makes that frame different pitch to pitch, and the release inherits the variance.	Consistency at foot plant . How repeatable are the front side positions in that one frame, not at release.

Tissue	The rotation has to come from somewhere. When the hip won't supply it, the lumbar spine and obliques do — from a total available range of about 13°. That's a structural mismatch, not a strength problem.	Hip internal rotation, both sides. A 5° side to side deficit predicted back and abdominal injuries across 258 professional player seasons.
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Test it before you coach it

The point of screening first is to separate *can't* from *doesn't*. Those need opposite interventions, and they look identical on video.

SCREENS, AND WHAT EACH ONE RULES IN OR OUT

SCREEN	LOOKING FOR	WHAT IT TELLS YOU
Seated and prone hip rotation both directions, both sides	A side to side difference of 5° or more in internal rotation	The core screen. Also record total rotation per hip — a hip can be tight in one direction and still have normal total motion, which changes the plan.
Hip airplane	Can he control rotation while standing on that loaded leg?	Separates passive range from usable range. Plenty of pitchers pass a table test and fail this one — that's a control problem, not a mobility problem.
Single leg RDL / split squat hold	Can the front leg brake and hold position under load?	Tests whether he can be an axle at all. A hip with range but no eccentric strength still collapses.
End feel on the rotation test	Springy and soft, or abrupt and bony?	Soft usually means tissue you can change. A hard, early, bony end feel points at joint structure you cannot stretch into — and shouldn't try to.
On the biomech report	Hip–shoulder separation at contact · when peak pelvis speed occurs · front knee extension speed	Confirms the pattern is actually costing him. A late pelvis peak and a slow knee are the fingerprints of this specific fault.

Fixing it, in order

The order is the whole intervention. Drilling the pattern before the joint can reach the position just teaches a more sophisticated version of the same compensation.



STAGE 1

Give the joint something to give

Restore rotational range first — soft tissue, then joint. Nothing after this stage works without it.

- **90/90 hip switches**, unloaded first, then with a light hold at end range
- **Hip rotation holds under tension** (PAILs/RAILs style) — contract into the new range, don't just sit in it
- **Pigeon to half kneeling transitions** to work rotation with the pelvis controlled
- Release the surrounding tissue if it's the limiter — adductors, deep rotators, glute med

STAGE 2

Make the new range strong

Range you can't control is range you won't use under 90 mph of intent. Mobility alone regresses inside a week.

- **Romanian deadlift with a two second hold** at the bottom — teaches the hip to load and stay put
- **Split squat isometrics** at the landing angle, 20–45 seconds
- **Copenhagen planks** and **adductor slides** — the adductors decelerate the stride and stabilize the axle
- **Lateral lunge with reach** to load rotation with the foot planted

STAGE 3

Teach it to brake

The block is an absorbing skill before it's a producing one. This is the stage most programs skip, and it's the one that makes the hip an axle instead of a hinge.

- **Drop and stick landings** — can he arrive and hold, or does he sink and push again?
- **Hurdle hops with a stuck landing**, progressing to single leg and then lateral
- **Hip airplane** loaded, for control of rotation over a planted leg
- Retest knee extension speed from contact to release — that's the number that moves

STAGE 4

Pattern it with constraints, not cues

Change the task so the correct movement is the easiest solution. Telling him to "stay closed" or "don't spin off" adds tension without removing the reason.

- **Half kneeling med ball scoop toss** — rotation over a fixed front side, with the back leg unable to cheat
- **Step back and rocker patterns** to move pelvis initiation earlier and back into the ground
- A **lane or tape constraint** for stride direction rather than a verbal cue about the foot
- Then **film again**. Do not coach the back leg or the front foot directly — they're symptoms, and they resolve on their own when the hip can do its job

One note on naming, so this holds up

Internal and external rotation flip depending on what you call fixed

With the foot planted, the femur is anchored and the pelvis moves. Whether you call that motion **hip internal rotation** or **hip external rotation** depends entirely on whether you describe the femur moving on the pelvis or the pelvis moving on the femur — and both conventions are in common use. Two coaches can describe the identical movement with opposite words and both be right.

So this document leans on the **functional description** — what the joint has to allow and what you see when it can't — rather than resting the argument on a label. If you share this with a physio or a biomech lab, name the reference frame you're using and the disagreement usually evaporates.

What isn't ambiguous, and what actually matters: **the pelvis must be able to rotate relative to a planted femur**. If the joint can't provide that motion, the leg swings, the back side pulls early, and the lumbar spine pays the difference. That mechanism is the same regardless of what you call the direction.

When it isn't the hip

The same picture has other causes. Chasing hip mobility in these cases wastes months.



STRUCTURE The range isn't there to find Femoral version and hip morphology set a ceiling. A hard, early, bony end feel means the range is anatomical. Build the delivery around what he has instead of stretching at a joint that will not change.	BACK SIDE The back hip is the actual problem If the back hip can't hold counter rotation, the pelvis opens early on its own and the front side never gets a chance to anchor. Same video, different joint. Screen both.	CONTROL Range passes, pattern fails Normal rotation on the table plus a failed hip airplane means this is a control and timing problem. Mobility work will change nothing — go to stages 3 and 4.
CAPACITY It's strength, not rotation A hip with range that still collapses is a braking problem. The tell is that it's fine early and falls apart late in an outing.	PROTECTION He's guarding After a hip, groin, or oblique injury the nervous system restricts range around tissue it doesn't trust. Forcing range on that athlete is how the next injury happens.	PREFERENCE It's how he's built Some deliveries genuinely organize around less rotation and work. If the velocity is there, the block measures fine, and he's healthy, you're looking at a signature — not a fault.

Sources

Reference values are population means with real spread. They locate an athlete; they don't grade one.

- Decreased Hip Internal Rotation Increases the Risk of Back and Abdominal Muscle Injuries in Professional Baseball Players — 258 player seasons
- Hip Rotation Range of Motion Deficits and Core Injury
- Driveline — How We Interpret Biomechanics Reports (lead leg block, knee extension velocity)
- Driveline — Making Movement Changes in the Weight Room (restore → load → pattern)
- Driveline — The Interaction of Biomechanics and Command (foot plant as the firing point)
- Tread Athletics — Problem Solving Your Lower Half Pitching Mechanics
- Lumbopelvic-hip Control, Upper Extremity Joint Moments, and Drive Leg Ground Reaction Force in Adolescent Pitchers, *IJSPT*
- The Effect of Trunk and Lower Body Mechanics on Fastball Velocity, SportRxiv
- ASMI / Diffendaffer, Fleisig et al. — The Clinician's Guide to Baseball Pitching Biomechanics
- Fleisig et al. — Kinematic Parameters Associated With Elbow Varus Torque in Elite Adult Pitchers
- Glenohumeral internal rotation deficit and knee kinematics in pitchers (whole chain reorganization)
- Cressey — The Importance of Hip Rotation

Companion to *Deficiency or Adaptation*. Screen before you coach: *can't* and *doesn't* look identical on video and need opposite

