



FRONT HIP · LANDING POSITION & BLOCK TIMING

The Long Way *Back*

What happens when the front hip lands already turned out: the joint has to cover ground before it can resist anything, the lead leg bows instead of stacking, and the block shows up late — unless the athlete can produce force fast enough to pay for the distance he just added.

OUTLIER PERFORMANCE LAB COMPANION TO “SWING OR ROTATE”

Landing turned out doesn't make the block impossible. It makes it **expensive** — and whether he can afford it comes down to how fast he produces force.

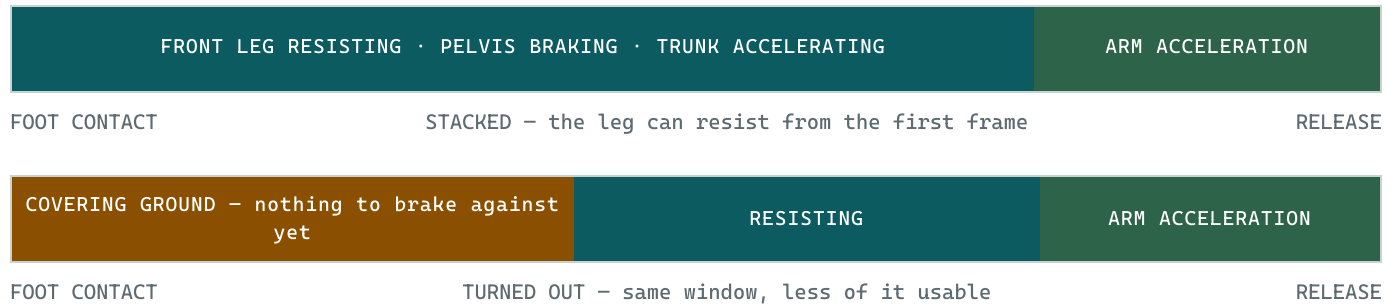
The block has to happen inside a window measured in hundredths of a second. Land at the far end of your rotational range and you've added ground the hip must cover before the leg can resist anything. That distance sets a price. Some pitchers pay it — they get back, stack up and block on time from a landing that should have been too open, because their hips produce force fast enough to cover it. Most can't, and their block arrives after the pelvis has already spent the rotation it was supposed to brake against. **A late block is what a strength problem looks like when the clock runs out.**

The window you're working inside

Everything here comes back to time. Degrees the hip has to travel are milliseconds it doesn't have.

Foot contact to ball release

Roughly 0.15 seconds. The final arm acceleration is about 0.03 of that.



Both deliveries get identical time. The difference is how much of it the front leg spends somewhere it can do something. And the orange band isn't wasted — it's **work**. The hip is covering that ground under load, and how fast it covers it is a trainable quality. A fast enough hip shrinks the orange and the block still lands on time. *Bars are illustrative proportions, not measured values.*

Why "get stronger" is the right idea and the wrong measurement

The window is shorter than the time it takes to express maximum strength. That one fact reorganises the whole problem.

He never gets to use his max

Reaching peak force in a maximal effort takes somewhere around **300 milliseconds**. The entire contact to release window is roughly **150**. The slice where the front leg is genuinely resisting is shorter still.

So the athlete never accesses his maximum — he only ever gets the fraction he can develop inside the time available. That quality, force produced *per unit of time* rather than force produced in total, is what decides whether he covers the distance before the pelvis is gone. A big squat that takes a second to express is not the currency this transaction accepts.

Which makes the honest version of "he isn't strong enough" longer and more useful: **he can't produce force fast enough, across the range he's asking himself to cover, in the time he has**. Three terms — and two of them are trainable in completely different ways.

The price, and who can pay it

Landing position sets the bill. Rate of force development decides whether he covers it. You need both numbers before you know what you're looking at.

LANDS STACKED – SHORT TRIP

LANDS TURNED OUT – LONG TRIP

HIGH RATE OF FORCE DEVELOPMENT

ON TIME, CHEAPLY

What you're aiming at

Short distance, plenty of force available to cover it. The block is early, repeatable, and survives fatigue because there's margin in hand.

ON TIME, AT A PREMIUM

The guy who gets away with it

These pitchers are real and they are not doing it wrong on the radar gun. Freakish hip speed and strength cover ground that shouldn't be coverable. But **he's spending capacity on the trip instead of on the block**, and doing it through a bowed limb. Works until it doesn't.

ORDINARY RATE OF FORCE DEVELOPMENT

USUALLY FINE

Adequate, less margin

The trip is short enough that ordinary capacity covers it. Most healthy deliveries live here. Getting stronger raises the ceiling but isn't repairing anything.

LATE BLOCK

The common failure

The distance exceeds what he can cover in the time he has. The leg bows, the knee snaps after the chest has already turned, the chest never gets the handoff. **This is most late blocks — and it is genuinely a position problem and a strength problem at the same time.**

Which lever you pull

Two ways out of the bottom right box and they both work: **shorten the trip**, or **raise the rate**. They aren't competing explanations — they're the same equation approached from either side.

Shortening the trip is faster, cheaper and more reliable. Landing position responds to constraint work in weeks. Raising rate of force development enough to buy back twenty or thirty degrees of travel is a project measured in years with a real ceiling, and not every athlete has that ceiling in him.

So the default is position first, capacity alongside. But **if you only ever coach position you're leaving half the equation on the table** — and for a pitcher whose landing is already reasonable, rate of force development is the only lever left to pull.

Stacked, or bowed

Why the distance is expensive in the first place. A front leg either transmits force along its length or it doesn't.

LANDING STACKED

The leg becomes a post

Foot, knee and hip line up along the direction the force is travelling. Ground reaction force runs **up the length of the limb**, through the joint centres, and arrives at the pelvis as something the body can rotate against.

Bone and joint alignment carry the load. Muscle steers it rather than holding the whole structure together — which is why this position is cheap to hold and still there when he's tired.

LANDING TURNED OUT

The leg bows

The femur is rotated away from the line of force, so the knee sits **outside** the path between foot and hip. The limb takes load across itself instead of along itself, and you see a lateral bow while the foot stays planted.

Now soft tissue holds a shape alignment should have held. That's the second half of the bill: the trip costs him time, and the position it leaves him in costs force he'd otherwise have spent on the block.

What the delay costs, downstream

TRUNK

The chest never gets the handoff on time

Braking the pelvis is what spikes chest rotation speed. A brake arriving after the pelvis has turned through leaves the trunk accelerating on its own. Velocity reads flat despite a lower half that looks busy.

ARM

The arm covers the gap

Whatever the chest doesn't deliver, the arm supplies. This is the profile that reads as high elbow load with unremarkable velocity — real stress that isn't buying anything.

KNEE

The bow loads the joint sideways

A knee outside the line of force takes that force across the joint rather than through it. Note this gets **worse, not better**, in the strong athlete who successfully covers the distance — he's driving more force through the same bad geometry.

GROIN The adductors hold what alignment should With the femur turned out and the limb bowed, the inner thigh becomes the structure stopping the leg collapsing further. Adductor complaints in a pitcher who otherwise trains well are worth reading as a landing position problem.	COMMAND Foot plant stops being repeatable Foot contact is the last stable frame before everything rotates. A landing that varies pitch to pitch makes that frame vary, and release inherits it. Misses spray rather than cluster.	FATIGUE Rate fades before strength does The one that matters most for the strong compensator. Fatigue degrades how <i>fast</i> you produce force well before it degrades how much. His margin was rate — so he loses precisely the thing he was paying with, and a block that worked in the first is late in the sixth.
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What it looks like on video

Watch the frame the foot touches, then the four after it. That's where this lives.

CONTACT FRAME The knee already points away from the target Freeze the exact frame of touchdown. If the kneecap aims outside the foot, the femur landed turned out and the distance is already added.	FRAMES 2–4 The knee drifts out before it straightens The signature. A visible lateral bow, then the snap. Stacked landings straighten from the first frame.	TIMING The chest is already turning when the knee locks Line the two up. The block should lead the trunk, not chase it. Lockout after the shoulders have squared is late — however hard the lockout looks.
EFFORT Violent lower half, ordinary velocity A hallmark of paying the premium and only just affording it. Enormous visible work through the legs and hips, unremarkable radar. The effort is going into the trip rather than the block.	INNINGS Clean early, gone by the sixth If landing and timing hold when fresh and fall apart with pitch count, you're watching someone cover the distance on capacity he can't sustain for a full outing.	FINISH He works around the leg, not over it With no stacked post to get on top of, the finish swings around the outside. Frequently mistaken for a trunk or arm path problem.

Test it

Two numbers, not one: how far he has to travel, and how fast he can produce force. Either on its own will mislead you.

WHAT TO CHECK, AND WHAT EACH RESULT MEANS		
CHECK	LOOKING FOR	WHAT IT TELLS YOU
Femur direction at the contact frame	Where the kneecap points relative to the foot and the target line	Half the equation — the size of the bill. Judge the femur, not the foot.
Foot angle, recorded separately	Open, closed or square, noted independently of the femur	These two come apart constantly. A square foot with a turned out femur is common and invisible if you only watch the spikes.
Knee extension speed, timed against trunk rotation	Not the peak value — when the peak lands relative to the chest	Tells you whether he's currently covering the bill. A strong number arriving after the chest turns means he isn't getting there in time.
Rate of force development countermovement jump, drop jump, or a rate based isometric pull	Force produced in the first 100–200 ms, not the peak	The other half, and the currency this actually spends. A very strong athlete with poor early phase output reads the same here as a weak one — which is the whole point.
Lateral bound: distance and time to recontact	How quickly he leaves the ground again after landing	Closest field proxy for absorbing and returning force through a hip in the frontal and transverse planes.
All of the above, fatigued	Late outing video, or retesting after a workload	Where the compensator gets exposed. Rate declines before strength does, and that gap is the diagnosis.
Total hip rotation, both directions	How much range exists, and where inside it he lands	Separates landing badly inside a normal range from having little range to begin with. Different problems, opposite fixes.

Fixing it, in order

Both levers, weighted by which one moves faster. Position first because it's cheap and quick — capacity alongside it, not instead of it.

STAGE 1

Confirm the position is even available

Before changing the delivery, check he can reach and hold a stacked landing slowly. If he can't find it at walking pace he will never find it at intent.

- **Drop and stick** from a low box — arrive with the knee tracking over the foot, hold three seconds
- **Split squat isometric** at the landing angle, watching whether the knee stays stacked as fatigue builds
- If the position isn't available at all, screen rotational range before assuming it's a skill problem — see the companion document

STAGE 2

Shorten the trip

The fastest moving lever. Reduce how far the hip must cover before it can resist, by landing nearer the position it needs to be in.

- **Stride direction work** with a lane or tape constraint, so the path stops forcing the femur open
- **Walking and shuffle deliveries** at low intent, watching only the contact frame
- **Constraint over cue.** "Land stacked" describes a position he can't see; a lane he has to land inside changes the task instead

STAGE 3

Raise the rate, not just the total

The other half, and the half that most often gets programmed wrong. Heavy slow strength builds the ceiling; on its own it does not buy force inside 150 milliseconds.

- **Build the base first** — trap bar deadlift, split squat, hip thrust. You can't express a rate you have no force to develop
- **Then train the rate** — trap bar jumps, drop jumps, lateral bounds with a stuck landing, rotational med ball throws at full intent. Low reps, full rest
- **Eccentric and isometric emphasis** — the block absorbs before it produces, and absorption is where the trip is actually paid for
- **Copenhagen planks and adductor work** — the inner thigh is what stops the limb bowing under force he's now producing faster
- Program these as quality, never as conditioning. Rate of force development collapses the moment the reps become fatiguing

STAGE 4

Time it again, then measure again

The outcome isn't a bigger number. It's the same number arriving earlier — and still arriving earlier in the sixth.

- Compare **when** the knee straightens relative to when the chest turns
- Watch the four frames after contact — the bow should be gone, not merely smaller
- Check separation and pelvis timing, since those are what a punctual block buys
- **Retest fatigued.** If it only holds when fresh, the position moved but the capacity didn't

When to leave it alone

Some pitchers land turned out, cover the ground anyway and throw hard doing it. That's a real profile, not a lucky accident — and dismantling it can cost more than it returns.

CASE 01

He's paying the bill and the numbers say so

Block on time, velocity where it should be, arm load reasonable, healthy. He has the capacity the position demands. That's an expensive solution that works — not a fault.

CASE 02

The trip is where his rhythm lives

For some athletes that travel is part of the timing of everything above it. Shortening it mechanically can desynchronise the whole delivery. Change it slowly and watch command, not just the landing frame.

CASE 03

The range genuinely isn't there

If hip structure caps his rotation, a turned out landing may be the best available position rather than a habit. Build capacity around it instead of stretching at a joint that will not change.

BUT PRICE IT HONESTLY

Three things to keep watching

Even when it works: it fades with fatigue faster than a stacked landing, it drives more force through a bowed knee, and it ages badly — the rate of force development paying for it is the first quality a pitcher loses. Monitor the late innings, the knee and the groin.

How this differs from a hip that can't rotate

Both faults live at the front hip and both end with a block that doesn't do its job. They are not the same problem.

COMPANION DOCUMENT

Not enough range

The hip runs out of rotation, so the pelvis can't turn around the femur and **the leg swings the pelvis open instead**. The back leg is pulled through early to supply rotation the hip refused.

Tell: the foot pivots on the dirt, the back leg comes through early.

Fix: restore rotational range first. No amount of strength substitutes for range that doesn't exist.

THIS DOCUMENT

Enough range, wrong end of it

The range exists — he lands at the far end, so the hip must cover ground before it can resist. **The leg bows and the block is late unless he can pay for the distance**.

Tell: the knee drifts out then snaps; lockout after the chest turns; clean early, late when tired.

Fix: shorten the trip and raise rate of force development. Both, in that order.

They stack, and the order matters

A pitcher short on rotation often learns to land turned out, because setting the femur early buys room he doesn't have. Then you have both faults at once — and **restore the range first**, because asking for a stacked landing from a hip that can't rotate out of it just moves the compensation somewhere less visible.

The screen that separates them is total hip rotation. Adequate range with a turned out landing is this document. Limited range is the other one. Both together is both, in that order.

Sources

Timing values are approximate and vary by athlete and by lab. The time budget bars are illustrative proportions, not measurements.

- ASMI / Diffendaffer, Bagwell, Fleisig et al. — [The Clinician's Guide to Baseball Pitching Biomechanics](#) (phase durations, landing kinematics)
- Driveline — [How We Interpret Biomechanics Reports](#) (lead leg block, knee extension velocity thresholds)
- Driveline — [The Interaction of Biomechanics and Command](#) (foot plant as the firing point)
- Driveline — [A Different Model for Cueing Pitching Mechanics](#) (constraints over cues)
- NSCA — [CSCS program design](#): force–velocity curve, rate of force development, phase potentiation
- [Force–velocity curve and rate of force development](#) — why time to peak force limits how much strength is usable
- [The Science of Training Rotational Power](#) — rate based rotational qualities
- [The Effect of Trunk and Lower Body Mechanics on Fastball Velocity](#), SportRxiv (lead knee findings)

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- [Decreased Hip Internal Rotation Increases the Risk of Back and Abdominal Muscle Injuries \(258 player seasons\)](#)
 - [Fleisig et al. — Kinematic Parameters Associated With Elbow Varus Torque in Elite Adult Pitchers](#)
 - [Lumbopelvic-hip Control, Upper Extremity Joint Moments, and Drive Leg Ground Reaction Force in Adolescent Pitchers, *IJSPT*](#)
 - [Tread Athletics — Problem Solving Your Lower Half Pitching Mechanics](#)
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Companion to *Swing or Rotate* and *Deficiency or Adaptation*. Two numbers decide this one: how far the hip has to travel, and how fast he can produce force. Neither on its own tells you what you're looking at.