



LEG LIFT & DRIVE · LOADING THE BACK HIP

False *Load*

Hiking the hip produces tension, and tension feels like loading. But the tissue under tension has no line of pull into the pitch — so the athlete gets the sensation of being coiled without storing anything he can spend.

OUTLIER PERFORMANCE LAB COMPANION TO “SWING OR ROTATE” AND “THE LONG WAY BACK”

A hip hike isn't a small version of loading the hip. It's a **different movement in a different plane**, performed by muscles that can't contribute to the throw.

Real loading is a *shift* — the body moves over the back leg and stretches the tissue that will shorten to drive it forward. A hike is a *lift* — the pelvis is pulled up on the lift side by the low back and the side of the trunk, while the centre of mass stays where it was. Both produce tension. Only one produces something the delivery can spend. And because the athlete is going on feel, the wrong one is the easier one to keep doing.

What loading actually means

Worth being precise, because "load the back hip" gets used to mean four different things.

Stretch the tissue that will produce the movement

Loading is not tension in general. It's putting a specific muscle and tendon unit on stretch **so that when it shortens, it drives the movement you actually want**. Load the glutes and adductors of the back hip and they shorten into hip extension and rotation, which is the pitch. That's stored energy with somewhere to go.

Tension in the side of the trunk is also tension. But the quadratus lumborum and the lateral chain produce **side bending**. Side bending isn't a movement the delivery needs, so shortening those tissues contributes nothing to the ball. The energy has nowhere to go — it just gets spent holding a position and then paid back into standing up straight again.

So the test for whether something is a load isn't "does it feel tight." It's **"will this tissue shorten into the movement I'm about to make?"**

Shift, or lift

They look similar from the front for about a tenth of a second, and then they diverge completely.

LOADING — A SHIFT

The body moves over the leg

The centre of mass translates laterally until it sits over the drive foot. The pelvis stays close to level or drops slightly on the lift side, controlled by the **drive side glute medius working eccentrically**.

The drive hip flexes and takes the body's weight. Glute max, glute med and the adductors go on stretch — and all three shorten into hip extension and rotation when he goes.

- Belt line stays roughly level
- Weight visibly arrives over the back foot
- Tension is felt in the **glute and inner thigh**
- The rib cage stays stacked over the pelvis

FALSE LOAD — A LIFT

The pelvis moves and the body doesn't

The lift side pelvis gets pulled up toward the ribs by the **quadratus lumborum and the lateral trunk**. The knee rises because the pelvis rose, not because the hip flexed under it.

The centre of mass never gets over the drive foot. The drive hip is not carrying much, so the glutes never go on stretch — there's nothing stored to release.

- Belt line tilts up on the lift side
- Weight stays between the feet, or drifts away from the drive leg
- Tension is felt in the **low back and the side**
- The rib cage side bends to counterbalance

The fastest test you have

Before any camera or screen, ask him. Athletes are unreliable about what their mechanics look like and remarkably reliable about where they feel effort.

"At the top of your leg lift — where do you feel that?"

GLUTE · INNER THIGH · DEEP IN THE HIP

He's loading

The tissue under tension is the tissue that drives the pitch. Whatever else is going on, this part is working. Late in an outing this athlete's **glute** is what's tired.

LOW BACK · SIDE · "OBLIQUES"

He's hiking

The tension is real and it's in the wrong place. He is genuinely working — just in a plane the pitch doesn't use. Late in an outing this athlete's **side and low back** are what's tired, and that's the same tissue that shows up in oblique strains.

Why this question works when cues don't

A hike and a shift can produce a similar looking leg lift on video, especially from the front. But they cannot produce the same sensation, because different tissue is doing the work. **The feel is the more sensitive instrument here — it just has to be pointed at location rather than intensity.**

"Does it feel loaded?" is a useless question; both answers are yes. "*Where* does it feel loaded?" separates them immediately.

Why the feeling is so convincing

This is not an athlete being lazy or inattentive. The sensation genuinely reads as loading, and there are reasons it's persuasive.

01 Tension is tension The nervous system reports effort, not usefulness. A hard working quadratus lumborum feels exactly as loaded as a hard working glute. Nothing in the sensation tells him which one has a line of pull into the pitch.	02 Hiking is easier Lifting the pelvis with the lateral trunk takes less strength and less balance than shifting the whole body over one leg and controlling it there. Under fatigue or pressure, the body will always find the cheaper solution.	03 It looks like a big leg lift A hike produces knee height, and knee height gets praised. He's being rewarded for the thing that's masking the problem.
04 "Coil" and "load" are felt, not seen Most cueing around loading is sensory — get in there, feel it, sit into it. An athlete chasing a feeling with no way to check it will settle on whichever movement produces the most feeling for the least work.	05 It often hides a weak glute medius If the drive side hip can't stabilise the pelvis in single leg stance, hiking is the available strategy. The hike isn't the disease — it's the symptom of a hip that can't hold him up on one leg.	06 Nothing contradicts him immediately He still throws. Velocity might be acceptable. The bill arrives as a tired lower back in the fifth inning and an oblique in April — far enough downstream that nobody connects it to leg lift.

What it costs

WHERE THE BILL LANDS

COST	MECHANISM	WHAT YOU'D MEASURE
The drive never gets built	With nothing stored in the back hip, forward momentum has to come from somewhere else — usually quad driven knee extension, or simply falling toward the plate. Both are worse sources than a loaded hip.	Stride length as a share of height, and whether the drive is a push or a fall. Reference stride is about 83% of height.
The centre of mass goes up, not out	A hike raises the pelvis. Vertical movement doesn't become ball speed — it becomes airtime, and it has to be paid back on the way down.	Does the head and belt line rise at leg lift? Forward momentum comes from force applied against the ground <i>over time</i> , not from elevation.
The pelvis arrives tilted	A frontal plane tilt that hasn't been undone by foot contact means the whole rotational axis is off. The lead leg lands into a pelvis that isn't level, which compromises the block before it starts.	Belt line angle at the contact frame, not just at leg lift. And whether lateral trunk tilt at release has crept up to compensate.
The low back does hip work	The quadratus lumborum and obliques are being used as primary movers in a delivery that will repeat this a hundred times an outing. This is the tissue that shows up in oblique and low back strains.	Where he's sore after outings. Glute soreness is a good sign; side and low back soreness after leg lift work is not.
It has to be undone before he can rotate	A hiked pelvis has to come back level before it can rotate cleanly — which costs time inside a window that doesn't have any to spare.	Same logic as a turned out landing: distance to travel, inside about 0.15 s from contact to release.

What it looks like on video

Film from the front or from behind. This is a frontal plane fault and the side view hides it almost completely.

BELT LINE The waistband tilts up on the lift side The single clearest marker. Draw a line across the top of the hips at peak leg lift — level or slightly down toward the lift side is a shift; angled up is a hike.	KNEE HEIGHT Big knee, quiet hip The thigh gets high but the hip joint itself hasn't folded much. The knee rose because the whole pelvis rose underneath it.	CENTRE OF MASS The weight never arrives over the back foot Watch the head and sternum. In a shift they travel laterally over the drive leg. In a hike they stay put or drift the other way as a counterweight.
RIB CAGE He side bends to stay upright Hiking one side of the pelvis forces a compensating lean above it. You'll see the space between ribs and pelvis close on one side and open on the other.	CONTACT FRAME The tilt is still there when the foot lands The one that matters most. A hike that's resolved before contact is far less costly than one still present when the block is supposed to happen.	INNINGS It grows with fatigue As the drive side glute tires, the cheaper strategy takes over more of the movement. Compare the first inning's leg lift with the fifth on the same camera.

Screen it

The question is whether he *can* stand on one leg and control his pelvis. If he can't, the hike isn't a habit — it's the only thing available to him.

WHAT TO TEST, AND WHAT IT RULES IN OR OUT		
TEST	LOOKING FOR	WHAT IT TELLS YOU
Single leg stance, 30 seconds hands off the hips, eyes forward	Does the pelvis stay level, drop on the free side, or hike up?	The core screen. A drop points at a weak stance side glute medius; a hike is the compensated version of the same weakness.
Single leg stance under fatigue	The same test after a set of lateral work or late in a session	Where most athletes get exposed. Passing fresh and failing tired matches exactly what the video shows across an outing.
Glute medius strength side lying abduction, or a loaded hip airplane	Capacity and control on the drive side specifically	Tells you whether stage 2 of the fix is needed at all. Published work links drive leg pelvic control to lower shoulder loading, so this matters beyond the hip.
Lateral trunk length and tone	Whether the quadratus lumborum and lateral chain are short and dominant on one side	Distinguishes a tissue that's tight from a strategy that's habitual. Both need addressing, in different ways.
"Where do you feel it?"	Glute and inner thigh, or side and low back	Free, instant, and more diagnostic than most of the above. Do this one first.
Leg length check	A genuine structural difference between sides	Rules out the case where a hike is an accommodation to anatomy rather than a fault. Worth ruling out before a long intervention.

Fixing it, in order

Give him the capacity to stand on one leg, then teach the shift as a movement rather than a feeling, then point the feeling somewhere new at the right place.

STAGE 1

Build the leg he's avoiding standing on

If the drive side hip can't hold a level pelvis in single leg stance, no cue will remove the hike — it's the only strategy he has.

- **Side lying and banded hip abduction** for direct glute medius capacity
- **Copenhagen planks** for the adductor side of the same job
- **Single leg stance progressions** — eyes closed, then with a reach, then under fatigue
- **Loaded hip airplane** once basic control is there

STAGE 2

Stop the low back volunteering

The lateral chain has been the primary mover. It needs to be both released and outcompeted.

- **Suitcase carries** — the cleanest exercise for resisting side bend there is, and it directly trains the position you want at leg lift
- **Side planks** with a level pelvis, holding rather than hiking
- **Soft tissue and length work** for the quadratus lumborum and lateral chain if it's genuinely short
- **Full exhale core work** to reconnect the rib cage over the pelvis, since a side bent rib cage is part of the pattern

STAGE 3

Teach the shift as a movement, not a sensation

Replace the feeling based cue with something he can see or a task he has to complete. He can't feel his way out of this — the feeling is what got him here.

- **Drop the leg lift height** temporarily. Height is what the hike is buying; take it out of the equation while the pattern rebuilds
- **Lateral shift drills** against a wall or a bar, so arriving over the back foot is a task he either completes or doesn't
- **Slow motion leg lifts** in front of a mirror or a phone, watching the belt line rather than the knee
- **Constraint over cue.** "Load your back hip" is exactly the instruction that produced the hike in the first place

STAGE 4

Point the feeling somewhere new, then check again it

The athlete needs a new internal reference, because he'll go back to the old one the moment nobody's watching.

- Ask the question again: **where do you feel it now?** The answer should have moved to the glute
- Check the **belt line at the contact frame**, not just at leg lift — that's where the cost is
- **Retest tired.** The hike returns under fatigue first, so a fresh only fix isn't a fix
- Watch where he's sore after outings. Glute is the goal; side and low back means the pattern is still there

When it isn't a fault

Some pelvic elevation is normal, and not every tilted belt line is costing anybody anything.

CASE 01 It resolves before foot contact A hike at peak leg lift that's gone by the time the front foot lands has largely spent itself in a phase where it doesn't matter much. Judge the contact frame before you judge the lift.	CASE 02 It's structural A real leg length difference or a pelvic asymmetry can make a level belt line the wrong target for that athlete. Build capacity around his anatomy rather than chasing a symmetry he doesn't have.	CASE 03 It's part of the rhythm Fast, springy athletes who lift high and go often carry some elevation as part of the timing. If the pelvis is level at contact, the drive leg force is there and separation holds, you're looking at style.
BUT PRICE IT HONESTLY Three things to keep watching Even when it's tolerated: it grows with fatigue, it puts the low back and obliques in a primary mover role they aren't built for, and it makes the pelvis a moving target at foot plant — which is the frame command depends on.		

Where this sits alongside the other two

All three are lower half faults that end with a delivery the arm has to rescue. They fail at different moments.

THREE FAULTS, THREE MOMENTS			
DOCUMENT	FAILS AT	THE MECHANISM	FIRST MOVE
False Load <i>this one</i>	Leg lift and drive	The back hip never gets loaded, because the pelvis was lifted instead of the body being shifted. Nothing is stored to spend.	Glute medius capacity, then teach the shift as a task rather than a feeling.
Swing or Rotate	Foot contact	The front hip has no rotational range, so the leg swings the pelvis open instead of anchoring it and the back leg is pulled through early.	Restore rotational range. Nothing else works first.
The Long Way Back	Contact to release	The front hip lands at the far end of its range, so it has ground to cover before it can resist. The leg bows and the block is late unless he can pay for the distance.	Shorten the trip, and raise rate of force development.

They compound in sequence

A pitcher who never loaded the back hip arrives at foot contact with less momentum to convert and a pelvis that may still be tilted — which makes the front hip's job harder and a late block more likely. **Work them in delivery order**, because a fault upstream changes what downstream is being asked to do.

Sources

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

- Lumbopelvic-hip Control, Upper Extremity Joint Moments, and Drive Leg Ground Reaction Force in Adolescent Pitchers, *IJSPT* — drive leg pelvic control and shoulder loading
- Gluteus Medius and Scapula Muscle Activations in Youth Baseball Pitchers, *J Strength Cond Res*
- Decreased Hip Internal Rotation Increases the Risk of Back and Abdominal Muscle Injuries in Professional Baseball Players — 258 player seasons
- Tread Athletics — Problem Solving Your Lower Half Pitching Mechanics (vertical vs horizontal drive)
- Driveline — Making Movement Changes in the Weight Room (restore, load, then pattern)
- Driveline — A Different Model for Cueing Pitching Mechanics (constraints over sensory cues)
- Driveline — The Interaction of Biomechanics and Command (foot plant as the firing point)
- The Effect of Trunk and Lower Body Mechanics on Fastball Velocity, SportRxiv (stride length and velocity)
- ASMI / Diffendaffer, Bagwell, Fleisig et al. — The Clinician's Guide to Baseball Pitching Biomechanics
- NSCA — CSCS program design (frontal plane capacity, loading that resists side bend)
- Cressey — The Importance of Hip Rotation

Companion to *Swing or Rotate, The Long Way Back* and *Deficiency or Adaptation*. The question that separates a load from a hike takes four seconds: *where do you feel it?*