STRATAA SPORTS MEDICINE PHOENIX, AZ

THE STRATAA DISPATCH

SPORTS MEDICINE, MINUS THE JARGON

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— THE PHYSICS ISSUE

WHY YOUR ACL DOESN'T STAND A CHANCE AGAINST PHYSICS

A love letter to Newton, a breakdown of every NFL position's knee, and why the same forces that make football beautiful are exactly what tear ligaments apart.

Okay so real talk — I've been sitting on this newsletter for weeks because I could not stop nerding out over it. Every time I'm in clinic explaining an ACL tear to a patient, I catch myself reaching for physics before I reach for anatomy. Because here's the thing nobody tells you: your ACL isn't weak. It's just outmatched. It's a two-inch band of tissue being asked to referee forces that would make a linebacker blink.

So this month we're doing the physics of the ACL, and then we're going to look at where it shows up on an actual football field — because the position you play (or played, or your kid plays) tells you a shocking amount about your risk.

THE FORCE NOBODY WARNS YOU ABOUT

Your ACL's whole job is to stop your shin bone from sliding forward and rotating under your thigh bone. It's a rotational and anterior-translation brake. Most of the time it does this job quietly and you never think about it once.

The trouble starts with something called dynamic valgus — basically your knee caving inward while your foot stays planted. Picture the knee collapsing toward the midline while the hip rotates in and the body's weight keeps moving. Researchers have consistently found that this valgus collapse, paired with a straighter-than-ideal knee at the moment of landing or cutting, is the biomechanical fingerprint behind most non-contact ACL tears. Add a big ground reaction force — the equal-and-opposite jolt your body absorbs the instant your foot hits the turf — and you've got a system where the ligament is taking a load it was never built to carry alone.

Small knee bend. Big valgus angle. Big ground force. That combination shows up over and over in the research as the exact recipe for a non-contact tear.

Here's the part that gets me every time: about a third of ACL tears happen with zero contact. No hit, no collision, nobody touching you. Just your own body decelerating wrong. That's physics doing damage all on its own — momentum, torque, and a planted foot conspiring against a ligament that's doing its absolute best.

OKAY, NOW LET'S TALK POSITIONS

This is where it gets interesting for anyone who watches or plays football. I pulled the position-by-position injury data because I wanted to know: does the physics I just explained actually show up where you'd expect?

Short answer — yes, and it's not subtle.

ACL INJURY RISK BY POSITION GROUP (NFL, DECADE-SCALE DATA)

POSITION GROUP	RISK PATTERN
Wide Receivers / Tight Ends	Consistently the highest injury incidence of any group. Constant cutting, single-leg landings on contested catches, sudden deceleration at top speed.
Running Backs / Linebackers	Elevated risk tied to repeated plant-and-cut movements and high-speed contact at odd knee angles.
Interior Linemen	Higher risk than perimeter linemen — more twisting under load in tight spaces at the snap.

Perimeter Linemen (tackles, DEs)	Notably lower risk — more linear movement, less repetitive cutting.
Specialists (K/P/LS)	Lowest injury incidence by a wide margin — minimal cutting or contact exposure.

Notice the theme? It's not the biggest hits that predict the injury — it's the cutting. Every position on that high-risk list shares one thing: rapid change of direction on a planted foot, usually at speed, usually with the knee somewhere it doesn't love being. That's the valgus-and-extension pattern from earlier showing up in real games, on real turf, over and over.

One more detail that always surprises patients: injury data across multiple seasons shows tears spike hardest in August. Preseason. Camp. The exact moment athletes are ramping intensity back up after months of lower load. Your tissue capacity doesn't come back as fast as your competitive instinct does — that gap is where a lot of tears live.

WHAT THIS ACTUALLY MEANS FOR REHAB

This is the part I want every patient — and every parent of a young athlete — to actually sit with. If the injury mechanism is mostly about deceleration, rotation, and landing control, then rehab that only chases strength numbers is incomplete. Quad strength matters. Hamstring strength matters even more as a stabilizer. But

none of it means much if we haven't retrained how the body absorbs force on a single leg, under fatigue, at game speed.

That's why return-to-play isn't a date on a calendar for me. It's a checklist of physics: can this knee tolerate a valgus moment without collapsing, can this athlete decelerate on one leg and stay controlled, can they do it tired, in the fourth quarter, when technique is the first thing to slip. If we haven't tested that, we haven't actually tested readiness — we've just tested time.

That's it for this issue. If you're rehabbing a knee right now, or you've got a kid playing a cutting sport this fall, this is exactly the lens I want you thinking through. Hit reply or bring it up at your next visit — I love talking about this stuff way more than is probably normal.

DR. T

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COMING NEXT ISSUE

September: shoulder instability and the throwing athlete — same physics playbook, totally different joint. See you then.

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