Peter Attia MD Keypoints — Injury, Pain & Mobility

Peter Attia MD Keypoints

Episodes in this pack: 10

Navigating bone health: early life influences & strategies for improvement & injury prevention

Date: 2025-07-07 · Duration: 1:46:07
URL: https://www.youtube.com/watch?v=Zld5iuH5anQ

KEYPOINTS

• Falls become a leading cause of death after 75, and hip fractures are especially deadly

Peter's team plotted CDC data from 2019. Before about 60, overdoses dominate accidental deaths. After 65, falls do. Per 100,000 people, fall deaths at 75+ trail only heart disease, cancer and Alzheimer's. This 2022 AMA, rebroadcast in full, argues you can't wait until you're in that age group to act, just as you wouldn't wait for a heart attack to fix apoB.

• A hip fracture carries a higher one-year death risk than smoking

In one data set more than 40% of men over 90 die within a year of a hip fracture, and roughly a third of people over 80 do. A ~200-person study found 25% six-month mortality after 65. A Finnish series of ~400 patients found about 27% one-year mortality. A pooled cohort of ~122,000 people aged 60+ found a one-year hazard ratio of 2.78, above end-stage kidney disease (~2.76) and smoking (just under 2).

• Bone is living tissue that's constantly rebuilt

Osteoblasts build bone; osteoclasts break it down. Bone is 50–70% mineral (mostly calcium), 20–40% organic matrix, and the rest water and fat. The whole skeleton turns over in about 10 years, and bone holds nearly all the body's calcium. Low blood calcium raises parathyroid hormone, which pulls calcium from bone and activates vitamin D, which helps the gut absorb calcium. Bone marrow also houses the memory B and T cells behind lasting immunity.

• Osteopenia and osteoporosis are points on a continuum

Osteopenia is about a 10% drop in bone mineral density versus a young healthy adult; osteoporosis is about 25%. Diagnosis uses both hips and the lumbar spine (L1–L5), where the deadly fractures happen. A T-score compares you with a healthy young adult; a Z-score compares you with people your age. A Z-score of " 2 means lower density than 97.5% of peers.

• Ask for a DEXA scan that reports each hip and the spine separately

DEXA is quick and very low-radiation. Many centers report only whole-body BMD, so confirm they'll report left hip, right hip and lumbar spine. Peter estimates basic body-composition scans at about $100–150 and full analyses at up to ~$400. Guidelines screen women at 65 and men at 70 (earlier if high risk). The WHO suggests women by 40. Peter looks at BMD in patients in their 30s and finds a Z-score of " 1 at 35 as concerning as a bad glucose tolerance test.

• Peak bone mass is built from about 8 to 20

BMD roughly doubles between 8 and 20, peaks in the early 20s and stays flat until 40–50. Around menopause women lose about 3–7% a year for 7–10 years, slowing to 0.5–2% after 65. Men over 65 lose 1–2% a year from a higher starting point. Women lose mainly spongy (trabecular) bone. A woman who misses her genetic peak by 20 starts lower for life, though work before menopause can narrow the gap.

• Estrogen controls how bone responds to load

Bone cells sense the strain muscles put on them through tendons and add bone in response. Estrogen regulates that signal, so the sudden withdrawal at menopause is devastating without replacement. Men make estrogen from testosterone and lose it gradually as testosterone falls. Extra body fat may add load and estrogen.

• Peter thinks bone health should be part of the HRT decision

The consensus still says HRT isn't standard care for postmenopausal bone loss. Peter notes the Women's Health Initiative clearly showed fewer fractures. He calls its breast-cancer increase (about 0.1% absolute) virtually non-existent and says the cardiovascular concern came from oral estrogen. Topical estradiol avoids that, and he believes HRT lowers cardiovascular risk.

• Resistance training and high-force sports build the most bone

Resistance training beat running, swimming, cycling and even plain jumping for preserving BMD. Powerlifting beat regular strength training in postmenopausal women. Football and MMA had the highest BMD, but come with head and joint injuries. Peter suspects running underperforms because elite runners are very lean. Walking, gardening and golf (and his own racing and archery) don't load bones enough.

• How you lose weight affects bone

Weight loss by diet alone tends to reduce BMD. In a small study, people who lost weight with substantial exercise slightly gained BMD, although they lost a bit less weight. Changes in leptin, adiponectin and estrogen may explain some of the loss, and loading the bones may offset it.

EXAMPLES

• The child whose bones were 'rubber bands'

A friend doing mission work in Rwanda showed Peter a five-year-old whose legs bent painlessly because of rickets. Within about six months of better nutrition, he was normal.

• Starting smoking before 16

Never-smokers had the best bone density later in life, people who started before 16 the worst, and later starters were in between. A patient with a 20-pack-year history who had quit more than 15 years earlier still had very low BMD and needed an endocrinologist.

• Bisphosphonates in mice immobilized with Botox

Female mice given a bisphosphonate while one leg was paralyzed kept femoral BMD similar to controls. Peter has no idea if it applies to humans.

• Bed rest and paralysis

Unused bone can lose about 2% a month in microgravity or partial paralysis, and up to 7% a month with complete paralysis, again mostly spongy bone.

• Peter's shoulder surgery

Right after surgery he got his surgeon's OK to use cycling blood-flow-restriction cuffs to keep stressing his biceps. That was only possible because the biceps tendon itself wasn't repaired.

OTHER RELEVANT

• Know your risk factors

A parent with a hip fracture (genetics account for up to 50%), a fracture from standing height or less, BMI under about 18–19, the female athlete triad, smoking history, and long-term corticosteroids. Prednisone at 5 mg a day can measurably reduce BMD within 3–6 months, and inhaled steroids used for childhood asthma count too. PPIs and phenytoin carry weaker risks.

• Cover calcium, vitamin D and magnesium

Peter treats these as minimums: calcium 1,000–1,200 mg, D3 800–1,000 IU, magnesium 300–500 mg a day. He takes about 1 g of supplemental magnesium a day across several forms. Some forms loosen the bowels, so choose based on your gut.

• Load bones heavily and often

Lift, carry, and ruck: Peter rucks five days a week and seeks out hills, since walking downhill strains muscles more. Even isometric holds count when you're laid up.

• For kids: nutrition, activity and power

Make sure they eat enough, aren't too lean and don't smoke, and do sports with jumping and lifting rather than running alone.

• Leave drugs to specialists

Bisphosphonates (Fosamax, Boniva, Actonel) raise BMD about 4–6% at the hip and spine and cut fractures, and are usually stopped after about five years. Peter's practice refers patients needing them to endocrinologists.

350 Injury prevention, recovery, and performance optimization for every decade

Guest: Kyler Brown
Date: 2025-05-26 · Duration: 1:50:55
URL: https://www.youtube.com/watch?v=CFXe36Bh4dQ

KEYPOINTS

• Prehab before surgery and a strong 'roll cage' around the joint allowed Attia out of a sling in 24 hours.

Attia's labrum was almost completely detached; it had been diagnosed by arthrogram in 2009 and was repaired by surgeon Alton Barron. With about eight weeks before surgery, Brown, a chiropractor turned rehab specialist, did aggressive supraspinatus and serratus work, used blood-flow restriction, and trained core and scapula–rib control. Barron didn't cinch the joint tight for liability's sake. Measurable stability plus Attia's strict rule-following let him skip the usual 4–6 weeks in a sling and use gentle isometrics instead of early rotation work.

• To be a capable 80-year-old you must be a robust 50-year-old, so train for the far target.

Attia's archery analogy: if you're accurate at 100 yards, 40 yards is easy, and difficulty rises non-linearly with distance. Training for the 'marginal decade' (the Centenarian Decathlon) builds strength, muscle and fat loss now. It also builds a buffer, so a strong person who rolls an ankle sprains it less. Stacked injuries, such as meniscus repairs, are how people lose hiking and then health.

• Most people lose capacities they stopped using—especially jumping and reactive footwork.

Attia jumped rope 25 minutes a day as a teenager, then didn't jump at all from 20 to his mid-40s. That's a setup for the classic middle-aged Achilles rupture. Kids jump off rocks and twist; adults stop. Brown wants people to keep playing reactive, randomised games and to rebuild jumping deliberately rather than suddenly.

• Rehab should build capacity under one coordinated plan, not deliver passive services.

Red flags: one therapist running four patients through the same insurance-coded routine, a room full of tables, ultrasound and stim instead of weights, 30 tedious exercises nobody sticks with, or a 30-year-old surgeon's handout with no follow-up. Good signs: one-on-one sessions, progressive loading, and a surgeon who refers to specific clinics based on their strengths. Even pro sports struggle with 'too many cooks' and contract-driven priorities.

• Pain often appears far from its cause.

Jill Attia, a marathoner, developed right knee pain after racing two marathons seven weeks apart. Running is a single-leg rotational movement (the 'spinal engine'). Mild scoliosis, pelvic rotation and a left proximal hamstring tendinopathy, confirmed by MRI, were 'dumping' load into the right knee. Treating only the knee usually means it comes back in 3–5 months.

• Real core stability is a pressurised cylinder that holds up in motion, not a six-pack.

Diaphragm, pelvic floor, transverse abdominis and multifidi must stiffen at the right time, then let the hips and shoulder blades move freely. When deep stabilisers fail, muscles like the biceps, traps or glutes guard and tighten. That's why needling or stretching gives about six hours of relief, while stabilisation training removes the guarding. One client's 'radicular' pain was actually referred from a gluteus minimus trigger point.

• Load tendons with heavy isometrics first, then progress to unloaded plyometrics, then full speed.

Train in three planes, not just straight-ahead calf raises. Long-hold and 'overcoming' isometrics, such as the isometric mid-thigh pull against a fixed bar, remodel tendons over weeks. Band-assisted pogos then train speed at less than bodyweight before full plyometrics. The test of readiness is the exercise itself, scored on numbers and quality, with double- versus single-leg gaps exposing balance deficits.

• Mobile feet and stiff feet fail in opposite ways.

Attia's swimmer feet are strong but too mobile to find stiffness. Rucking on uneven ground, and later an ill-advised pogo stick, flared tendons that are worst first thing in the morning—classic tendinopathy, which takes months to heal. His fix is a split squat with the front forefoot raised on a 45-lb plate, holding a calf raise. Rigid, weak feet in rocker shoes push force up to knees, hips and spine, so Brown checks foot and ankle first in any chronic knee case.

• Pain isn't the same as damage, and fear and stress amplify it.

Brown likens the brain to a contestant with a hand hovering over the Family Feud buzzer. Most MRIs over 30 show wear. He's seen 'thousands' of back flare-ups coincide with a partner's labour or job fears. Using scans to sell 40-visit packages makes people feel frail. Education and a plan empower them.

EXAMPLES

• Low back triage

Weakness or bowel or bladder changes mean immediate neuro or ortho referral. Otherwise, try conservative probes such as McKenzie extension work; symptoms 'centralising' from leg to hamstring is a good sign. Hot discs often settle in 4–10 weeks, and the better surgeons prefer to wait. One patient's disc herniation healed, but McKenzie work then aggravated an annular tear and had to be stopped.

• Attia's back flare-up fixed by isometric pressing

Barely able to limp in, he did supine 'leg press' isometrics with good intra-abdominal pressure, building to maximal effort against an immovable bar, and felt 'a million bucks' an hour later. Brown attributes this to reciprocal inhibition releasing the guarding muscles.

• Jill's PRP protocol

Two PRP injections about two weeks apart and around eight weeks of swimming instead of running. Meanwhile the team trained everything else hard, used BFR, and coordinated the PT, running coach and strength staff on a six-month plan.

• A 52-year-old executive

After a health scare, his testing showed very weak calves, poor balance and high Achilles and fall risk. So cardio and VO2 max work was designed around those risks rather than a running programme.

• A youth golf team

About 30% had lumbar stress fractures from heavy lifting with nobody watching technique. Brown says teens should get quick and coordinated first; strength can be added later.

OTHER RELEVANT

- **Prehab pregnancy and rehab postpartum**
  Brown argues that pregnant women should do foot strengthening and core work. Relaxin, weight and delivery change the feet, pelvis and pelvic floor, often showing up later as hamstring, sit-bone or knee pain.
- **Make your programme fit your life**
  Adherence beats perfection: swap exercises you hate, and adapt workouts to hotel gyms so two weeks of travel doesn't mean atrophy.
- **Treatments open a window; strength closes it**
  Adjustments, needling, cupping or even a cortisone shot are tools to lower pain so you can load and retrain. Strength is what makes improvements stick.
- **Keep doing barefoot work, but with care**
  Brown calls dropping barefoot training 'a pathway to frailty' but says to pair it with targeted stiffness and quickness work.

345 Chronic pain: pathways, treatment, and the path to physical and psychological recovery

Guest: Sean Mackey
Date: 2025-04-21 · Duration: 3:15:36
URL: https://www.youtube.com/watch?v=SsHdjDFNbp4

KEYPOINTS

• Pain is a biopsychosocial experience, not a simple wire to the brain.
Mackey, chief of pain medicine at Stanford, says Descartes' 17th-century model—injury sends a signal straight to the brain—stuck for centuries and lingers today. Only in the last 20 years or so have surgeons widely accepted that what patients bring to the operating table, including early-life experiences, shapes how much pain they feel.

• Different nerve fibers carry different pain, and referral explains odd symptoms.
Myelinated A-delta fibers transmit at about 10 m/s—roughly 10 times faster than unmyelinated C fibers—giving the sharp first pain before the dull ache. Bowel biopsies often don't hurt because those nociceptors don't respond to cutting; diaphragm irritation shows up as shoulder pain because both are served by C3–C5 ('C3, 4, 5 keeps the diaphragm alive').

• The spinal cord gates pain, so identical injuries feel different.
Melzack and Wall's 1965 gate control theory explains why ten people with the same injury report different pain, and why TENS and other neuromodulation can work. In a study applying a 48°C stimulus to about 500 people, ratings ranged from 0 to 10; Mackey's ice-water demo with medical students shows the same spread.

• Emotion, beliefs and sleep turn the volume up or down.
Mackey likens pain processing to a stereo amplifier set differently in each person. Peter notes his 42°F cold plunge sometimes feels like nothing for 10 minutes and sometimes makes his ankles scream after 30 seconds. Catastrophizing, a concept introduced by Albert Ellis in 1962, is a strong amplifier.

• Pain is evolutionarily essential.
People who can't feel pain make dangerous decisions and historically didn't pass on genes; Peter jokes he doesn't understand why more young males didn't die before 20. Cultural norms also reward stoicism—Mackey's father, one of 13 children, brought that ethic home.

• NSAIDs and acetaminophen work best thoughtfully combined.
NSAIDs and COX-2 inhibitors reduce the 'inflammatory soup' of swelling, redness and heat; Vioxx was withdrawn after FDA concerns. A combination of 400 mg ibuprofen and 500 mg acetaminophen three times daily worked well for Peter; naproxen at 500 mg twice daily is easier to line up. These are personal regimens discussed, not general prescriptions.

• Muscle relaxants and gabapentinoids have specific roles and side effects.
Peter uses 2–3 days of baclofen 20 mg with a little NSAID to abort back flares; Mackey generally goes up to 20 mg three times daily orally, with intrathecal pumps for severe spasticity. Gabapentin and pregabalin act on the alpha-2-delta calcium-channel subunit; gabapentin absorption saturates around 900–1,000 mg per dose, so he doses lower by day and higher at night (e.g., 300/300/600), and warns elderly patients about falls. Pregabalin can cause weight gain.

• Chronic pain is enormous in scale.
Mackey estimates 50–100 million Americans have chronic pain, about 8% (20+ million) with high-impact chronic pain; low back pain is the most common at about 28%.

• Opioids have a nuanced role, and the crisis had many parents.
Mackey criticizes how a brief letter to the New England Journal claiming little addiction was amplified by Purdue and others. Peter compares the crisis to the 2006–08 mortgage crisis: easy to blame one actor, but many contributed. Mackey's 2010 Institute of Medicine panel flagged the long-term effectiveness and safety of opioids for chronic pain as a top unanswered question.

• Low-dose naltrexone is a promising, cheap option for fibromyalgia and beyond.
At 50 mg naltrexone blocks opioid receptors; at about 4.5 mg it appears to block toll-like receptor 4 on microglia, calming neuroinflammation. Mackey has gone up to 13.5 mg in some patients. About 20–30% get vivid 'technicolor' dreams; if it's activating, take it in the morning. It must usually be compounded.

• Peter recovered from 320 mg/day of OxyContin to full function.
A 5 cm disc fragment sat on his S1 nerve root; he was taking about 320 mg of OxyContin daily—enough, he says, to kill two people today—to blunt emotional as well as physical pain. Mackey later gave him 400 mg of IV lidocaine over 20 minutes under EKG monitoring, followed by precise injections at T12–L1 facets over 3–4 months, and gabapentin he tapered off within 18 months.

EXAMPLES

• Peter's L5–S1
After multiple surgeries he has essentially no disc at L5–S1, leading to facet arthropathy higher up; his recovery is about '90% good', with a rare seconds-long flash of fire in the foot about once a year.

• Peripheral nerve blocks
A surgeon argued blocks were underused because nobody wants to wait 10 minutes for bupivacaine to work; even a 50% cut in post-op opioid needs would be huge. Stanford's acute pain service sees 30–50 patients a day.

• Acupuncture
Mackey's grant work is building a model predicting response to real versus sham acupuncture. The conversation keeps the claim tied to named mechanisms, numbers, and caveats so a listener can act or ask better questions without flattening the nuance.

• Cannabis

Few well-controlled trials show short-term benefit in neuropathic pain; UCSF researchers reportedly received study cannabis by armored truck.

- **Fibromyalgia criteria**

  The old 11 of 18 tender points have been replaced by multiple-site involvement plus a symptom severity score.

OTHER RELEVANT

- **Don't settle for 'cure' or 'give up'.**

  Mackey avoids promising cures but never gives up: there are 200+ analgesic drugs, 200+ procedures, mind-body and rehabilitative approaches to try.

- **Pair physical rehab with psychological recovery.**

  Breaking the pain cycle requires both; catastrophizing and fear can be treated. The conversation keeps the claim tied to named mechanisms, numbers, and caveats so a listener can act or ask better questions without flattening the nuance.

- **Ask about low-dose naltrexone for centralized pain.**

  It has a benign side-effect profile and decades of safety data at higher doses, though evidence is still developing.

- **Use NSAIDs short-term and smartly.**

  Combinations and timing can limit doses; discuss GI, kidney and cardiovascular risks with a doctor. The conversation keeps the claim tied to named mechanisms, numbers, and caveats so a listener can act or ask better questions without flattening the nuance.

322 - Bone health for life: building strong bones, preventing age-related loss, osteoporosis, & more

Guest: Belinda Beck
Date: 2024-10-21 · Duration: 1:48:48
URL: https://www.youtube.com/watch?v=bFvPbXC1lpQ

KEYPOINTS

- **Bone adapts to mechanical loading—its structure literally aligns with force.**
  Beck, an Australian bone researcher, notes that in 1882 scientists described trabecular struts aligning with the forces placed on them. Bone is a 'use it or lose it' tissue: it needs brief, high-magnitude loading, not endurance—'you don't need to run a marathon, just one sprint' to stimulate bone cells.
- **Peak bone mass is built in childhood and adolescence, and then it's a glider.**
  The growth spurt comes around 12 in girls and 13–14 in boys; bone accrual ends around 18 in girls and as late as 25 in boys when growth plates fuse, with most people done by 30. Peter's glider analogy: you reach maximum altitude about 20 years into life, and afterward the best you can do is slow the descent. Genetics explain an estimated 70–80% of bone density, per twin studies, so family history matters.
- **Women start with less bone and lose it faster, especially after menopause.**
  In their 20s women have less bone than men, and at menopause (average around 52–54) circulating estrogen nearly vanishes, accelerating loss for perhaps 5–8 years. By late life the gap is substantial.
- **Kids need calcium, vitamin D and diverse, load-bearing sport.**
  Teenagers need about 1,000 mg of calcium daily; a 250 ml glass of milk has about 300 mg, so about 750 ml of milk or equivalent (yogurt, cheese) covers most of it. In Australia sun before 10 a.m. and after 2 p.m. can supply vitamin D without burning. Swimming and cycling don't load bone enough—a 1992 Stanford study of varsity athletes found gymnasts 'off the scale' while swimmers resembled sedentary controls, though it was observational.
- **Vitamin D thresholds are debated.**
  Beck cites 30 ng/mL as a common deficiency cutoff and 50 as sufficient, with some arguing for 75; she defers to others on specifics. Peter supplements 5,000 IU daily to stay around 50–60 ng/mL, admitting he has no clear indication beyond a hope of being better off later.
- **Corticosteroids harm growing bones.**
  Beck advises keeping children off steroid inhalers where possible or titrating to the lowest dose, and making sure kids who need them get ample milk, sun and loading.
- **Inactivity rapidly causes anabolic resistance.**
  In cast-immobilization studies, after two weeks the casted leg showed about 40–50% anabolic resistance versus the other leg—not aging, just disuse. Movement throughout life matters.
- **DEXA T-scores and Z-scores mean different things.**
  Osteoporosis is a hip T-score of " 2.5 or lower (WHO), with " 1 to " 2.5 being osteopenia. A T-score compares you to an average 20–30-year-old of the same sex and race; a Z-score compares you to people your age—a Z of 0 is the 50th percentile, +1 about the 84th. Total hip is preferred over femoral neck because of analysis variability.
- **LIFTMOR showed heavy lifting is safe and effective for women with low bone mass.**
  About 100 postmenopausal women with low bone mass were randomized to high-intensity resistance and impact training—30 minutes twice weekly, four compound exercises (including deadlifts and squats) at about 85% of one-rep max, with jumping—or a low-intensity program, over eight months. Everyone had said their bones were too fragile; with expert coaching, it was safe.
- **The results rival drugs.**
  The training group gained a net benefit of a bit over 4% at the spine and about 6% at the femoral neck (controls lost about 2.5%). 3D hip analysis showed about a 13% net gain in femoral-neck cortical thickness. Function improved too: sit-to-stand, timed up-and-go, jumping, posture and grip strength.
- **The WHI scare left a generation of women untreated.**
  Peter calls the Women's Health Initiative's effect on hormone therapy one of the great tragedies of the past 25 years for bone health.
- **Middle age is about preserving bone before the menopause cliff.**
  For men and women in their 30s and 40s, Beck says most are on a plateau, so the goal is maintaining loading and avoiding the long sedentary stretches that drive loss. Women should build reserves before menopause. She acknowledges others may disagree given limited long-term data, but sees no downside to continued heavy, varied loading.

EXAMPLES

- **Women deadlifting 70 kg**
  Beck was puzzled how women lifting about 70 kg improved so much until geometric analysis revealed cortical thickening.
- **The 90-year-old deadlifter**
  Peter says he could watch a video of a 90-year-old woman deadlifting for days—the algorithm knows him well.
- **The Onero program**
  LIFTMOR became a clinic-based program, Onero, with accreditation via the Onero Academy, because Beck didn't think high-risk people should do it unsupervised; baseline testing takes 2.5 hours with yearly retests.
- **Masters athletes**
  Beck's long-term data on masters athletes support lifelong loading, though true lifelong trials are almost impossible.
- **From animal lab to humans**

Beck did an animal study for her PhD and quickly realized she didn't want to do that forever, steering her toward human trials and ultimately LIFTMOR.

- **Hearing, posture and falls**

  Peter notes hearing loss is a dementia risk via reduced sensory input; Beck argues posture and sensory awareness similarly matter for falls, alongside strength.

OTHER RELEVANT

- **Parents: maximize peak bone mass.**

  Ask what your 10-, 12- and 15-year-olds are doing: varied impact sports, weight training, calcium and sun.

- **Adults: lift heavy with coaching.**

  Brief, heavy compound lifts and impact twice weekly can build bone even after menopause.

- **Know your family history and get a DEXA.**

  Osteoporotic parents or grandparents signal high risk; check total hip T- and Z-scores. The conversation keeps the claim tied to named mechanisms, numbers, and caveats so a listener can act or ask better questions without flattening the nuance.

- **Train balance and posture for fall prevention.**

  A startle from a neighbor's dog causes falls; strength, posture and grip all reduce risk.

- **Don't rely on swimming or cycling for bones.**

  They're great for fitness but low in bone loading; add weight training and impact work, as many endurance athletes now do compared with the early 1990s.

296 Foot health: preventing common injuries, enhancing strength and mobility, & picking footwear

Guest: Courtney Conley
Date: 2024-04-01 · Duration: 2:34:06
URL: https://www.youtube.com/watch?v=htF_GapzU_c

KEYPOINTS

• The foot is a sensory and mechanical foundation that rehab tends to ignore.

Conley is a chiropractor and foot and gait specialist who came to feet through years of ballet pain and early work in orthotic labs. The foot has 26 bones and 33 joints in three sections (rearfoot, midfoot, forefoot), plus dense receptors that feed the balance system. Quoting Jay Dicharry, she says 'you can't build a jet engine on a paper airplane.' Clinicians train core, glutes and hips but rarely the foot, our first contact with the ground. Attia compares the feet to a race car's tyres.

• The heel is built to absorb shock, while the forefoot carries the biggest loads.

The calcaneus has a spongy core inside a thin cortical shell. Its fat pad has two chambers and, she says, absorbs shock about twice as well as Sorbothane. The forefoot takes about 8 times body weight at push-off in walking. The Achilles takes about 4 times body weight in walking and roughly double that in running, and the inner arch up to 11 times in running. She says the tissues can handle it, but 'if you don't use it you will lose it.'

• Repeated mild ankle sprains are more harmful than they seem.

The talus has no muscle attachments, only ligaments. When the lateral ligaments loosen, the talus can shift and cause inner-ankle pain often misdiagnosed as posterior tibialis dysfunction. Ligaments heal; the bigger issue is stretched or torn superficial peroneal nerves and lost sensory input. One of her patients 'couldn't feel anything' by his last sprains.

• Where a stress fracture occurs tells you how to treat it.

Compression fractures (heel, fifth metatarsal) come from heavy, rigid landings and need cushioning. Tension fractures (navicular, metatarsals, sesamoids) come from failing to control pronation, so after a boot they need strength rehab. Otherwise the healed bone sits in a weaker foot. Bunions are a midfoot–forefoot instability worsened by narrow shoes (shortened adductor, lengthened abductor). She warns many foot surgeries fail and says 'you don't come out of the womb with a bunion.'

• Plantar fasciitis usually signals a weak foot.

The plantar fascia attaches into the deep transverse metatarsal ligament. When the forefoot splays it creates a 'windlass'-like stability signal before push-off, which narrow shoes block. Flexor digitorum brevis shares load with the fascia, and its weakness predicts plantar fasciitis. Orthotics help acutely but, she says, research supports about two weeks to a year, and they need an exit strategy. For chronic plantar fasciosis she relies on loading and strength rather than rest, including shockwave to the medial gastrocnemius. Tendons heal through mechanotransduction: load signals the cells to remodel.

• She uses specific strength and mobility benchmarks.

On a toe dynamometer the big toe should press about 10% of body weight and toes 2–5 about 7–8%, without lifting the heel or clawing. In a straight-body wall lean, your toes should let you lean at least 4.5 inches. A single-leg seated calf raise (soleus) should handle about 1.5 times body weight. Attia managed about 1.3 and says almost everyone fails. Ankle dorsiflexion needs about 10° to walk, but she wants about 35°. The big toe needs 40–45° to walk and 65° to sprint.

• Toe weakness is the single biggest predictor of falls in older adults, she says.

She cites Karen Mickle's research. Toe strength declines about 35% between 50 and 80. Foot receptors need 20% more pressure by 50 and are about 75% less sensitive by 85. Exercise improves circulation and nerve branching and has improved sensation even in neuropathy. Her fall checks: toe strength, dorsiflexion and inversion/eversion range, single-leg balance (abductor hallucis), and hip control (glute max at heel strike, glute med in mid-stance). She'd screen children's feet the way schools check for scoliosis.

• Limited ankle dorsiflexion causes problems up the chain.

The three compensations are early heel rise (more forefoot load), knee hyperextension, and bending forward at the hips (low back pain). If someone can deep-squat while holding a rack, the limit is neurological, not tissue, so they need stability rather than 30 years of calf stretching. Attia notes people under anaesthesia can be stretched far further than awake. Conley says no posture is 'bad' if you can control it and get out of it, and pronation is the first shock absorber.

• Footwear rules: wide toe box, zero drop, and be careful with cushioning.

Test the toe box by standing on the shoe's removed insert: if your forefoot spills over, the shoe is too narrow. A wide toe box differs from a wide shoe, and some brands simply add stretchy uppers. Any heel drop is 'a high heel' in her world. More stack height speeds you through pronation. In one study by Sarah Ridge, simply wearing minimal shoes strengthened most foot muscles about as well as an exercise programme. Super shoes (about a 4% advantage) must be 'earned' with hamstring and calf strength.

EXAMPLES

• Barefoot kids

In an Indian study of about 2,300 children aged 4–13, roughly 3% of those who didn't wear shoes had flat feet versus about 9% of shoe wearers, and closed-toe shoes were worse than sandals. The arch develops in early childhood (the sustentaculum tali ossifies by about age 7).

• Hallux limitus vs rigidus

Weak peroneus longus fails to anchor the first metatarsal, so the big toe jams and its top becomes inflamed. Many patients progress to rigid arthritis if the toe is splinted with carbon plates instead of trained.

• Isometrics as 'pain meds'

After Attia jammed his little toe, she had him do gentle isometrics immediately to reduce the brain's protective inhibition. He still uses five minutes of them when sore.

• Attia's Achilles

Heavy rucking brought months of Achilles pain. Switching to a shoe with an 8 mm drop helped. Conley approves if he keeps up ankle mobility and calf strength.

OTHER RELEVANT

- **Toe spacers**
  Start with 5 minutes barefoot at home. It took Conley about six months on her weaker foot to wear them all day. She avoided recommended bunion surgery this way.
- **Achilles reassurance**
  Achilles tendinopathy can last years but rupture is unlikely. Pain up to about 5/10 is still a green light to train. Insertional cases need end-range calf work and no deep heel drops.
- **Running**
  Overstriding is the enemy, more than heel striking. Moving to a midfoot strike shifts load from knee, hip and back to the foot and calf, so build capacity first.
- **Fashion shoes**
  Stilettos and hockey skates are fine if you 'do the work before and after' in minimal shoes.

287 Lower back pain: causes, treatment, and prevention of lower back injuries and pain

Guest: Stuart McGill
Date: 2024-01-29 · Duration: 2:45:19
URL: https://www.youtube.com/watch?v=Z1_sb1auiV8

KEYPOINTS

• McGill says Attia's history fits a classic disc pattern.

Attia had disabling episodes every three years (at 21, 24 and 27), each triggered by bending (rowing, a steep climb, bending to lock a bike) and lasting about two weeks. The last became burning foot pain and required surgery for a roughly 5 cm free fragment from L5–S1. McGill, a professor emeritus at Waterloo, identified a posterior, left-biased open-fissure disc bulge that could be 'vacuumed' back in between episodes. He predicts Attia's facet joints at that level have since thickened, causing the occasional grumbling ache of the 'unstable phase' that Kirkaldy-Willis described.

• The spine is a flexible rod that must stiffen to carry load.

Discs allow motion and act as a mechanical stop at end range, which keeps the torso slender. Discs are layered collagen around a pressurized gel. Repeated load plus motion delaminates the layers from the inside out until the last layer gives way. The gel has never been exposed to the immune system, which sets off a fierce inflammatory reaction. Healthy discs have no nerves or blood vessels because high pressure prevents ingrowth; damage lets both grow in, so 'the body grows more hardware to feel pain.'

• L4–L5 and L5–S1 fail most because thicker structures tolerate bending poorly.

Strain, not force, drives damage. Like a thick stick versus a willow branch, the thick lower discs bear compression well but bending badly. Bigger skeletons have more lobed discs that concentrate stress when twisted, which is why world-record sit-up holders aren't powerlifters. Gymnasts' open facet joints allow twisting but make them prone to pars stress fractures (spondylolysis).

• Don't combine powerlifting and yoga adaptations.

Deadlifters stiffen their discs and tend to bulge posteriorly when flexing under load. Very flexible yoga spines bulge anteriorly when bending backward. Each should train hip and shoulder mobility for its own goal, and yogis should avoid very heavy loads. According to McGill, surgeons mostly replace the hips of 50-year-old women with 30 years of yoga and men around 50 who've deadlifted all their lives, not moderates.

• 'Chronic' back pain is usually repeated acute irritation, and 'non-specific' pain doesn't exist.

Most of his 'chronic' patients are re-triggering a specific mechanism throughout the day. Stop the trigger and the pain stops. He reserves 'chronic' for pain with changed central sensitivity and no clear mechanical trigger. He spends three hours per assessment provoking the pain to find its mechanism. No insurance billing code covers this, which he sees as the system's core failure.

• The McGill Big Three build stiffness in the core so the hips and shoulders can deliver power.

They are the modified curl-up (hands under the low back, head and shoulders hovering), the side plank and the bird dog. All spare the spine; the side plank loads only half the musculature. They're done as 10-second holds in a 'Russian descending pyramid.' One session increases torso stiffness for about 20 minutes or longer, so pain patients do short sessions mid-morning and mid-afternoon. Isometric training increased punch force in MMA athletes. But they aren't for everyone: already stiff people need mobility instead.

• Most people told they need surgery can avoid it with 'virtual surgery.'

At his university clinic every patient was followed for two years. Of those told they needed surgery, 95% reported avoiding it and being glad. The plan copies post-surgical rest and gradual return (day one: up only to use the bathroom), then desensitizes the pain mechanism and retrains mobility, stability and movement. He even manages sciatica this way if he can move the pain during assessment, including in NHL, pro tennis and UFC athletes.

• Surgery is warranted in specific cases.

These include red flags, which he says referrals have still let through: aortic aneurysm, pulmonary embolism, metastatic cancer. Also pain patterns that don't fit a spinal mechanism, severe multilevel stenosis needing laminectomy, cervical myelopathy, post-trauma instability, unstable spondylolisthesis compressing nerves that can't be controlled, and some Tarlov cysts. Even with spondylolisthesis he tries intensive stabilization first, and says slippage distance isn't the deciding factor.

• Aim for 'sufficient' strength rather than maximal deadlifts.

Ed Coan took months off after a true personal best. Max lifts cause microfractures under the end plates that take about a week to scaffold, so deadlifting heavy three times a week lets them accumulate. McGill steers older lifters toward goals like getting off the floor with grandchildren at 80. He uses backward uphill walking, sled work and log lifting. He values grip strength over deadlift numbers.

EXAMPLES

• The toilet squat

On stage in Europe, a tearful woman in her 70s was told she'd have to leave her home because she couldn't rise safely from the toilet. He taught her hands on thighs, hip hinge, feet apart and 'pull your hips through.' Within three repetitions she stood easily: 'I don't have to leave my home, do I?' 'Weightlifting 101,' he says.

• The suicidal patient

A man told his pain was 'in his head' gave McGill two weeks. Muscle EMG and motion tracking showed he switched off all his muscles at the top of a twist, which made the spine shift and trap the sciatic nerve. Coaching him to keep muscle tension through the movement stopped the episodes; he had none in 10 years.

• Whiplash on video fluoroscopy

Patients dismissed as pain magnifiers showed a mid-range vertebral 'clunk' matching their pain. Activating the deep neck

flexors (tongue to the roof of the mouth, grimace) stopped the clunk. A static MRI couldn't show it.

• Two gymnasts, same spondylolysis

One rested six months and stabilized; one kept training. McGill says he can predict nearly perfectly who makes the Olympic team.

OTHER RELEVANT

• Let inflammation work

He cites recent studies suggesting skipping anti-inflammatories lets macrophages clear extruded disc material. Lying face-down and breathing can help pull a bulge back in. Attia uses a mild muscle relaxant like baclofen instead of prednisone.

• Clues in daily life

Sharp pain when rolling over in bed, or needing many pillows, suggests micro-instability. A mobile, weak spine can hurt more than a strong, arthritic one; Attia's ugly MRI with big, healthy muscles is the contrast.

• Self-assessment

McGill's book Back Mechanic guides readers through pain triggers and simple tests (slouch, extension, compression, shear, nerve tension). Backfitpro.com lists certified and master clinicians.

• Desk life

He retired early partly because his job had become sitting. A 30-year-old who'd sat 'like a cashew' since 14 showed pain when slumping.

264 Hip, knee, ankle, and foot: common injuries, prevention, and treatment options

Guest: Adam Cohen
Date: 2023-07-31 · Duration: 2:18:40
URL: https://www.youtube.com/watch?v=ovyCBmINXRE

KEYPOINTS

• Hip problems in younger adults often trace back to how the hip formed.
Cohen, a Manhattan orthopedic surgeon specializing in sports medicine, explains that hip dysplasia in infants can be corrected if caught early. In adults under 50, abnormal hip shape contributes to labral tears and early arthritis; in his practice, far more women than men under 50 have had hip issues.

• Femoral-neck stress fractures are high-risk and must not be missed.
He separates stress fractures into high- and low-risk by the consequence of mistreatment. A tension-side femoral-neck stress fracture that becomes complete can lead to a hip replacement—devastating for someone in their 20s–40s. A 28-year-old runner with new hip pain needs imaging, not reassurance.

• Hip replacement has become remarkably successful.
Once a debilitating operation 30 years ago, it is now often outpatient, with satisfaction rates around 90–95% and low complications—which is why Cohen weighs cortisone and other temporizing measures against simply replacing a worn-out hip.

• Hip fractures in older adults are deadly, and the numbers haven't improved.
For people 65+ who fracture a hip, one-year mortality is about 15–30% depending on the study—roughly 20–30% for decades despite faster surgery—and about half of survivors lose a level of function, such as moving from no aid to a cane. Strength around the hips and bone health are the prevention.

• PRP evidence is mixed: decent for tennis elbow, weak for hip arthritis.
Platelet-rich plasma contains 800–1,000 plasma proteins; preparations vary, so 'dose' is undefined. Tier 1–2 evidence supports PRP for tennis elbow, but it doesn't seem to work well in hip arthritis. Saline injections also help some patients in trials, underscoring placebo effects.

• Stem cell marketing is largely inaccurate.
A study by NYU colleagues of about 1,000 websites promoting stem cell therapy found 94% made inaccurate statements, such as guaranteed new cartilage. Cohen advises skepticism toward '100% guaranteed' claims.

• An ACL tear raises arthritis risk whether or not it's reconstructed.
About 50% of people with an ACL tear develop significant knee arthritis within 15–20 years, and surgery doesn't seem to change that. One analysis suggested treating about 90 people to save one ACL. Any mechanical trauma to a joint raises arthritis risk; a shoulder dislocation makes shoulder arthritis 10–20 times more likely.

• Graft choice depends on age.
Reconstruction often uses the central third of the patellar tendon (about 10 mm of a ~30 mm tendon, with bone plugs from kneecap and tibia). Under about age 34, allograft (donor) tissue has unnecessarily high re-rupture rates; for a hiker in their 40s, allograft is reasonable.

• Knee replacement satisfaction lags behind hips.
About 85% of knee-replacement patients are satisfied—meaning 15% aren't. Recovery is nonlinear: about 80% of improvement comes by six months, with continued gains up to a year. Cohen sees patients about 10 days after surgery; many walk without a cane.

• Tendon degeneration is part of aging.
You may not be able to do everything you did at 20–30 because tendon degeneration is a biological process affecting everyone; cortisone can harm tendons, and Cohen has seen problems after a single dose.

• Save the meniscus when you can; sham-surgery studies don't apply to everyone.
The meniscus spreads force across the knee, so losing it accelerates arthritis—especially in knock-kneed or bow-legged people who already overload one compartment. Peripheral tears with good blood supply can be sewn back; bucket-handle tears can flip into the joint. Cohen says the sham-surgery trials showing no benefit studied degenerative tears in arthritic knees; a young person with a repairable tear and no arthritis should strongly consider fixing it.

• Arthritis often 'flips' from silent to painful after a minor event.
Cartilage wears away slowly as a low burn; then a stumble, a twist while lifting or a small further meniscus tear tips the joint into a painful, inflamed state. That's why patients often blame a trivial event for long-developing disease.

EXAMPLES

• Cohen's son's hips
His infant son was diagnosed with hip dysplasia and wore a brace 23 hours and 45 minutes a day—hell on his wife—but nine months later his hips were fine.

• Living without an ACL
Cohen tore his ACL and meniscus at 14 in the 1980s, rehabbed instead of reconstructing, lived actively from 15 to 30 with only occasional swelling, and had surgery after his fellowship—a bucket-handle meniscus tear included.

• The cyclist with a femoral-neck fracture
A 40-year-old crashed on the West Side Highway and broke his femoral neck; when a resident told him he had a 30% chance of dying that year, Cohen had to explain those statistics apply to frail older patients.

• A marathon on a new knee
A patient around 50 ran a marathon after total knee replacement, knowing the risks. The conversation keeps the claim tied to named mechanisms, numbers, and caveats so a listener can act or ask better questions without flattening the nuance.

- **Good mechanics matter more than load for joints.**
  Cohen describes an athlete squatting enormous loads safely with perfect mechanics. Running itself isn't inherently bad for knees; mechanics, strength and prior injury matter more.

OTHER RELEVANT

- **Investigate new deep hip or groin pain in active people.**
  Stress fractures can be catastrophic if missed. The conversation keeps the claim tied to named mechanisms, numbers, and caveats so a listener can act or ask better questions without flattening the nuance.
- **Strengthen hips and bones to prevent fractures.**
  Given 20–30% one-year mortality after hip fracture, strength, balance and bone density are priorities.
- **Be skeptical of biologic injections.**
  Ask what evidence supports PRP or stem cells for your specific condition; avoid guarantees.
- **Vet your surgeon.**
  Ask how often their patients get infections, need reoperation or still have pain a year out.
- **Young with a meniscus tear? Ask about repair.**
  If you don't have arthritis, preserving the meniscus may protect the knee for decades; don't assume 'surgery doesn't help' studies of older, arthritic knees apply to you.

232 Shoulder, elbow, wrist, and hand: diagnosis, treatment, and surgery of the upper extremities

Guest: Alton Barron
Date: 2022-11-28 · Duration: 4:33:07
URL: https://www.youtube.com/watch?v=CtGwx2VAH_E

KEYPOINTS

• The shoulder trades stability for mobility.
Alton Barron, an orthopedic surgeon specializing in the shoulder, elbow and hand (and the surgeon who operated on Attia), explains that the shoulder is a shallow ball-and-socket that relies on the labrum, capsule and rotator cuff for stability. That makes it the most mobile and among the least stable joints, which is why rotator cuff, labral and dislocation injuries are so common.

• History, mechanism and exam beat imaging alone.
Barron says if you compulsively take the history, mechanism of injury and symptoms and do a careful physical exam, you'll be about 95% accurate before the MRI. MRIs of people over 50 often show degenerative labral tearing that isn't the pain generator; he describes a woman in her early 60s told she needed surgery for such a tear, which is often the wrong call.

• Anatomy predisposes some people to injury.
The acromion comes in types: type 1 is flat (most people), while the hooked type 3 is far from rare (Barron estimated perhaps 30% for types 2–3) and predisposes to impingement mainly in overhead athletes and lifters. Spinal stenosis and other variants also change risk, so screening can be useful in contact sports.

• Frozen shoulder is common and often misread.
Adhesive capsulitis, which Barron sees two or three new cases of weekly in one office, shows as a stiff, tight capsule that blocks motion (for example external rotation stopping at about 30 degrees with pain). Its cause is unknown and multifactorial, worse with diabetes, and it can mimic or conflate other diagnoses. Neck problems can also refer pain to the shoulder, so the exam includes the cervical spine.

• Arthroscopy and better anchors transformed repair.
Barron started practicing in 1996, when most work was open surgery and early arthroscopic techniques were judged retrospectively, with high failure rates in some series. Modern repairs use heavy sutures and anchors into bone to reinforce healing, and age alone is not a barrier: he has repaired rotator cuffs in people in their 90s who healed fully.

• PRP and stem cells: plausible in places, oversold overall.
Barron uses PRP selectively in his Manhattan office for things like lateral epicondylitis and some tendon injuries, and thinks cells may help muscle tears, but says stem cells won't regrow a labrum. Many studies justifying these treatments are poorly designed, a lot of money is involved, and patients fly abroad (including Germany) for unproven injections.

• AC joint separations are graded by displacement.
Up to about 30% widening is grade 2; 100% or more is grade 3, with higher grades beyond. Many grade 3 injuries can be managed without surgery; a study of NFL athletes about 20 years ago supported this. Hockey players and quarterbacks hit by '300-pounders' are classic cases.

• Throwers' elbows depend on their shoulders.
Pitchers develop asymmetric shoulders, gaining roughly 45 degrees more external rotation on the throwing side; losing 10–15 degrees can add torque on the elbow. Tommy John (UCL) reconstruction revolutionized baseball, and throwers live with 15–20-degree elbow contractures and stay functional, since a 100-degree arc covers most daily needs.

• The hand is neurologically enormous.
More than half of higher cortical neurons (Barron says over 60%) map to the hand in the homunculus. Splinting a wrist in too much flexion or extension raises pressure on the median nerve and can cause acute carpal tunnel syndrome, so neutral positioning is safest. Hand fractures are finicky too: the average adult bone heals in about six weeks, but some wrist bones take 10–12 weeks.

• Thumb-base arthritis is extremely common.
Barron says about half of people will experience osteoarthritis of the thumb's basal joint in their lifetime, and perhaps a quarter of those (around 12.5% overall) may need surgery. Tennis elbow's sweet spot is ages 40–60, increasingly into the 70s as people stay active.

EXAMPLES

• Attia's shoulder
Attia describes a decade of shoulder pain and his own surgery with Barron, and the 'tissue work and training' that delayed it for years; archery practice of 100 shots the day before surgery illustrates how active he remained.

• Barron's father
Barron's father swam vigorously in Lake Travis at 94½ and died at 95 of pancreatic cancer; after a rotator cuff repair in his 90s you couldn't tell he'd ever torn it.

• The 97-year-old patient
Barron operated on both of a 97-year-old woman's shoulders back to back; she later greeted him on 57th Street saying she was doing great, which shows age alone isn't a contraindication.

• A musicians' foundation
Barron, who treats many musicians, co-founded a foundation to help uninsured musicians with Elvis Costello and Diana Krall, approved by the IRS in 2017, with a launch concert at Austin's Paramount Theater. A violinist might play 20,000 bow strokes in one Mozart concerto.

• Mom's wrist plate
Barron's mother broke her wrist at about 82 and got a titanium plate, part of his argument for fixing fractures aggressively in

active older adults.

OTHER RELEVANT

- **Get examined before you get scanned.**
  A careful history and exam should drive decisions; asymptomatic degenerative findings on MRI shouldn't automatically lead to surgery.
- **Protect external rotation and scapular mechanics.**
  Especially for overhead athletes, shoulder range and control protect the elbow. The conversation keeps the claim tied to named mechanisms, numbers, and caveats so a listener can act or ask better questions without flattening the nuance.
- **Be skeptical of biologic injections.**
  PRP may help specific tendon problems; stem-cell claims for structural repair are largely unproven and expensive.
- **Splint in neutral.**
  After wrist injuries keep the wrist neutral and fingers moving to avoid nerve compression. The conversation keeps the claim tied to named mechanisms, numbers, and caveats so a listener can act or ask better questions without flattening the nuance.
- **Don't let age stop treatment.**
  Active people in their 70s–90s can do well with repairs and fracture fixation. The conversation keeps the claim tied to named mechanisms, numbers, and caveats so a listener can act or ask better questions without flattening the nuance.

#152 - Michael Rintala, D.C.: Principles of Dynamic Neuromuscular Stabilization (DNS)

Guest: Michael Rintala
Date: 2021-03-08 · Duration: 1:44:56
URL: https://www.youtube.com/watch?v=y6OALVINgqI

KEYPOINTS

• DNS grew out of the Prague School of Rehabilitation.
Rintala, a San Diego chiropractor and one of about 18 international DNS instructors, traces the method to the 1950s Prague School at Charles University's medical faculty. Behind the Iron Curtain its three founding neurologists—Vladimír Janda, Karel Lewit and Václav Vojta—relied heavily on observation and palpation for diagnosis and treatment.

• Each founder contributed a piece.
Janda, who had post-polio effects himself, described postural habits in which certain muscles tend toward tightness and others toward weakness, and linked these patterns to where imaging shows the most degenerative and disc changes—accumulated rather than traumatic. Vojta studied motor development in the first 12 months of life and used it to help children with cerebral palsy form motor patterns around brain lesions.

• Pavel Kolá ’ GW&æVB F†W6R –FV 2 –çFò G–æ Ö–2 æWW omuscular Stabilization.
Kolá ’Â v†ò uns the rehabilitation department in Prague, began applying developmental kinesiology to athletes in the late 1990s and early 2000s, including javelin thrower Jan Železný and hockey player Jaromír Jágr. Through the early 1990s the Prague School's work was mainly rehabilitation for cerebral palsy and the general population.

• The diaphragm is a postural muscle, not just a breathing muscle.
Picture the trunk as a cylinder: the diaphragm is the top (attaching to the lower ribs, the xiphoid and around L1–L2 at the thoracolumbar junction), the pelvic floor the bottom, and the abdominal wall the sides. When the diaphragm descends it creates intra-abdominal pressure; the pelvic floor and abdominal wall load eccentrically 'like wind blowing into a sail,' then hold that pressure to stabilize the spine.

• How you generate pressure matters.
Lifting 300 pounds requires abdominal pressure, but DNS favors an 'inside-out' strategy—pressure loading the abdominal wall, followed by an interplay of concentric, eccentric and isometric work—over relying on concentric bracing alone. When the deep system can't create a fixed point through the trunk and pelvis, the brain compensates with overactive superficial muscles.

• Infant development is a blueprint for ideal movement.
Around three months, maturation lets genetically ingrained motor programs coordinate the deep stabilizers. Milestones follow: rolling to the side around seven months, oblique sitting around eight, crawling around nine, kneeling at 10–11, squatting about 12, standing at 13–14 and walking about 14–16 months, with variation (Rintala's son walked at 10 months). He cites an observation that about 70% of infants mature normally while the rest sit on a spectrum toward pathology.

• Modern childhood interrupts that process.
Shoes too early, propping devices and walkers, then six or seven hours a day in school chairs, can disrupt alignment between the pelvic floor and thoracic diaphragm. Postural habits that follow undermine pressure management and force transfer through the spine.

• Most low back pain is chronic overload, not injury.
Outside trauma like a car crash or fall, Rintala sees inefficient deep stabilization paired with overactive flexors and extensors, producing hinging at the lumbosacral region—'like bending a spoon' repeatedly—until passive structures such as discs and facet joints give way. Attia notes roughly 80% of people will experience back pain.

• Train inside your functional threshold.
The functional threshold is the load at which you can keep quality stabilization; beyond it lies the 'functional gap,' where bracing strategies get the job done at the cost of efficiency. Athletes live in that gap, and poor programs or overtraining keep them there, risking long-term stability.

• Adherence is the biggest limitation.
Of 100 athletes in pain, Rintala estimates only 10–20% stay with the program until better, partly due to access to one-on-one care. DNS requires slow practice, such as relearning to breathe, which Attia frames as efficacy versus effectiveness: it may work when practiced, but must be stuck to.

• Eccentric and concentric loading both matter.
Rintala defines concentric loading as a muscle shortening under load (the lifting phase of a biceps curl) and eccentric as lengthening under load (the lowering phase). Neither is 'right'—they serve different purposes, and more eccentric emphasis tends to drive hypertrophy—but most people train the concentric and neglect the eccentric. In DNS, eccentric loading of the pelvic floor and abdominal wall is central to stabilization.

EXAMPLES

• Rintala's own spondylolysis
Premature at birth, overtraining with poor recovery, he developed a pars stress fracture in college; his L4–L5 region gave way, starting a chronic pain cycle that led him to Kolá ’ &÷VæB # c# à

• Long careers at the top
Železný, holder of the javelin world record of 98.48 meters, had a roughly 20-year career; Jágr was still playing at 48. Kolá ’w2 work with them emphasized awareness and quality over quantity.

• Roger Federer and PGA golfers
Rintala points to Federer and well-coached tour players as athletes who stay within their functional capacity while still pushing performance.

- **The 89-mph fastball**
  At the other end of his practice are uninjured athletes seeking performance—like a pitcher stuck at 89 mph who needs a better 'whip' between hand, opposite leg and hip; Major League Baseball increasingly integrates DNS.
- **An infant's hands-to-mouth task**
  Placed on their back with hips and knees at 90 degrees and ankles neutral, a healthy infant can bring hands together and to the mouth. Attia notes most adults take this for granted, but it requires a stable trunk as a fixed point; observing whether an adult can reproduce such positions reveals stabilization gaps.

OTHER RELEVANT

- **Relearn diaphragmatic breathing.**
  Practice breathing that expands the lower trunk in all directions as a foundation for stability.
- **Build quality before load.**
  Increase strength thresholds only once you can maintain stabilization; pair DNS with a coach's strength program.
- **Move from rehab to prehab.**
  Once out of pain, keep practicing developmental positions to prevent recurrence.
- **Reduce prolonged sitting for kids and adults.**
  Varied positions help preserve the pelvic floor–diaphragm alignment that supports the spine.
- **Find trained practitioners.**
  DNS certification has clinician, trainer and pediatric tracks, the last culminating in Prague; video and hands-on teaching beat verbal explanation.

#128 – Irene Davis, Ph.D.: Evolution of the foot, running injuries, and minimalist shoes

Guest: Irene Davis
Date: 2020-09-14 · Duration: 1:53:06
URL: https://www.youtube.com/watch?v=L7iHfxOrqJI

KEYPOINTS

• Irene Davis moved from prescribing orthotics to minimising support

Davis, a physical therapist and biomechanist who moved from the University of Delaware to Harvard, used to match shoes and orthotics to foot type. Her early instinct came from rehab, where the goal was to remove bracing so patients could build their own strength. Her cousin, who had quadriplegia, had to move 100% of his body with about 25% of his muscle power. Her views on running shoes shifted after she met the evolutionary biologist Dan Lieberman and joined his 2010 Nature paper.

• Matching shoes to foot type doesn't prevent injuries

In Joseph Knapik's military studies of roughly 7,000 service members, people given shoes 'matched' to their arch type had the same injury rates as those who all got the same shoe. The arch types were motion-control shoes for flat, flexible feet, cushioned shoes for high, rigid arches and stability shoes for normal arches. Davis says that result made her question her own prescribing.

• Humans evolved as endurance runners

With 26 bones and many small muscles, the foot is well equipped to walk and run without support. Lieberman's argument is that over 24 hours no animal can cover more distance than a human, because we shed heat through sweat while big animals such as kudu overheat. For about two million years we ran barefoot or in minimal footwear, like 10,000-year-old sagebrush sandals found at Fort Rock, Oregon.

• Running injuries became a research topic only after cushioned shoes arrived

Olympic marathoners around 1900 ran in thin leather soles, and that remained broadly the case until the 1960s and 70s. Davis says the first running-injury articles appeared in the early 1970s, after cushioned, raised-heel shoes let people land on their heels without learning to cushion the landing. She concedes there's little good high-speed data from before cushioned shoes.

• The steepness of the impact matters, not just its peak

Heel striking creates a sharp impact spike before propulsion. The steeper its slope, the higher the rate of loading, which studies link to running injuries. Forces at the knee can reach about seven times body weight, or 1,400 lb for a 200-lb runner. Several studies show people hit harder in highly cushioned shoes such as Hoka. Her rule: if you stay a rearfoot striker, keep cushioning under your heel.

• Retraining runners to land softly cut injuries by 62%

In a study of 320 novice runners, half did eight treadmill sessions, building from 10 to 30 minutes, with visual feedback on their impact and the single instruction to land more softly. Over the following year, their injuries fell 62% compared with controls. They weren't told how to change their form.

• Orthotics weaken the foot, and minimal shoes strengthen it

A study under review fitted healthy feet with orthotics for 12 weeks: intrinsic foot muscle size fell 10–17%, with no change in controls. In Sarah Ridge's study at BYU, gradually walking in minimal shoes strengthened the foot almost as much as an eight-week 'foot core' exercise programme. The arch has about 10 muscles in four layers.

• Make the transition slowly

Davis's 'pre-gait' programme lasts one to three months, longer for older people, who are 'less plastic'. It includes foot strengthening, hip and knee work, teaching people to engage their foot muscles while moving, and hopping, lunging, plyometrics and skipping rope. Patients should be able to walk briskly for about 30 minutes in minimal shoes before adding running, or they'll load the foot faster than it can adapt.

• Knee valgus is the most common malalignment

In more than 700 patients at her running injury clinic, the two most common features are hard landings and the leg collapsing inwards: knees coming in, the kneecap rotating inwards and the pelvis dropping on the opposite side. Her prospective and retrospective studies of IT band syndrome found the same pattern, which pulls on the band's attachment near the knee. Weak hip muscles let the pelvis drop.

• Shin splints are often a heel-striking overuse problem

New runners who land on their heels must use the muscle at the front of the shin to lower the foot. Without conditioning, it becomes sore from overuse.

EXAMPLES

• La Sierra High School

From 1955, Marine Stan LeProtti ran a 30-year programme of daily 55-minute PE with boot-camp-style fitness at this school in Carmichael, California. It is featured in the documentary 'The Motivation Factor'. Only 21 of perhaps 20,000 students reached the top tier. Davis proposes studying the alumni, now aged roughly 55–79.

• Plantar fasciitis

Patients who 'just want to run again' get an approach Davis calls 180 degrees from what they've been told: anatomy lessons on the arch muscles, strengthening and a gradual move to minimal shoes, rather than more support.

• Shoe lifespan

Conventional shoes should be changed every 300–500 miles. Davis now wears Xero shoes for their wide toe box. Attia bought them for his young children.

• Attia learning to swim at 31

He relied on drills and short bursts of 50 yards with lots of rest so his technique wouldn't break down, and compares this to slowly rebuilding running form.

OTHER RELEVANT

- **Transition over months**
  Walk in minimal shoes first, strengthen your feet and hips, then add short runs gradually.
- **Land softly**
  Aim for quieter, lower-impact foot strikes. Treadmill feedback on impact works even without detailed form cues.
- **Don't rely on shoe-type matching**
  Arch-based shoe prescriptions didn't reduce injuries in large studies. The conversation keeps the claim tied to named mechanisms, numbers, and caveats so a listener can act or ask better questions without flattening the nuance.
- **Watch for knees collapsing inwards**
  If they cave in or your hip drops, strengthen your hips and core, and consider a gait analysis.
- **Let children move**
  Running is an activity of daily living, not a skill to be taught. Minimal footwear lets young feet develop.