How Elite Athletes Reawaken Dormant Muscles (Without More Reps)

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Even the fittest bodies can lose muscle activation after injury or surgery. Here’s what athletes are doing to reignite muscles.

More than 4 million Americans had hip and knee replacements in 2024, according to the American Academy of Orthopedic Surgeons. And they are becoming increasingly common among active adults in their 40s, due to better surgical tech and higher activity levels. More people are choosing surgery so they can stay active rather than live with arthritis or pain.

After months of pain that kept him from even walking down the stairs, Super Age founder David Stewart joined that group in May 2025. At 66, he underwent a partial knee replacement. And like many people who undergo such a surgery, he found that while his pain was gone, the muscles in his legs weren’t working quite as they should.

“My VMO was not firing,” Stewart says. The VMO is the vastus medialis oblique, one of the quadriceps muscles that’s just above the kneecap. And 12 weeks into rehab, the muscle wouldn’t flex, and wouldn’t gain strength.

When Strength Suddenly Disappears

Stewart was experiencing a phenomenon called arthrogenic muscle inhibition, **or AMI**. After surgery, this condition, where muscles won’t fully contract, is common. This inhibition was keeping Stewart from recovering; his quadriceps seemed to want to relegate Stewart from his normally active life to the sidelines.

Stewart, like most Super Agers, wasn't ready to accept that. But unlike most of us, he's friends with Picabo Street, one of the best skiers in American history. With two gold medals and decades on the mountain, Street knows plenty about knee pain. She recommended Stewart visit a sports injury chiropractor in Utah who has helped her turn inhibited muscles into active ones since 2001: Craig Buhler.

Buhler has worked not just with Street, but all manner of athletes, for decades. He was on staff with the Utah Jazz for 24 years, and still consults with Hall of Famer John Stockton, in addition to working with more contemporary athletes like NFL receiver Odell Beckham, Jr. His Advanced Muscle Integration Technique (AMIT), he says, can turn dormant, inhibited muscles back "on" through mechanical pressure at multiple sites on the body.

Months later, thanks to Buhler's treatments, Stewart says his VMO is firing at full strength. That's a small miracle: This type of inhibition can be stubborn, and it's one that scientists are still learning about, and continue to try to solve.

The Science of Arthrogenic Muscle Inhibition (AMI)

Stewart's bout with AMI was a normal, protective response that occurs in a joint after an injury, says Adam Lepley, PhD, director of the Performance, Rehabilitation & Injury Management Through Exercise Lab at the University of Michigan, where he studies AMI.

"After an injury, the body tries to limit movement to reduce pain and prevent further damage. For example, when someone tears their ACL, the nervous system automatically 'shuts down' part of the quadriceps muscle. Even though the quadriceps itself isn't injured, the nervous system reduces the signal to the muscle so the joint experiences less loading and less instability," he says.

AMI is usually a useful response that acts kind of like a circuit breaker. Your body "shuts down," or really slows down, a section of your musculature so that the circuit

won’t get overloaded; instead of firing 100 percent of its fibers, a muscle might drop down to 80 percent capacity. This happens, Lepley says, through sensory structures in your joints called mechanoreceptors. These provide feedback to the nervous system about joint position and movement. After injury, the feedback they send isn’t the same, so the nervous system interprets the joint as unstable or injured.

The challenge, Lepley says, is getting the muscles to turn back “on.” After surgery, for example, your nervous system doesn’t necessarily register the surgical procedure as a fix. Mechanoreceptors don’t always return to normal function, so the inhibition can remain long after the tissue is healed.

“Imagine after an injury that your nervous system shuts off 20 percent of your quadriceps to protect your injured knee joint,” Lepley says. “If you have surgery to fix the problem, or just go through the normal healing process, your nervous system still considers your joint ‘injured’ and the muscle is still inhibited. When you engage in exercise during rehabilitation, you’re then strengthening only about 80 percent of the muscle. You may still get stronger, but you’ll never reach your full potential because part of the muscle remains inhibited.”

This doesn’t just happen with surgery. Major injuries trigger AMI, and minor ones may too. Any abnormal signal from our joints, Lepley says, like swelling or irritation, can probably trigger some level of this inhibition. And if it takes a while for the muscle to turn “back on,” or even if it doesn’t at all, that’s usually OK: Our body finds new movement patterns, compensating for the lower firing rate of the inhibited muscles. These patterns can often be pain – and injury – free.

But when they’re not, or when high-level athletes (or Super Agers) want to restore full function, scientists and physicians haven’t completely figured out how to do AMI. This is, in part, Lepley says, because the source of AMI isn’t always the same: In some cases, the inhibition may start in the spinal cord. In others, the signals come from the brain.

Reactivating Dormant Muscles

Scientists kind of throw everything at AMI to get muscles turned back on, employing “disinhibitory treatments” that target different levels of the nervous system, and take lots of different forms, Lepley explains: Electrical nerve stimulation and neuromuscular electrical stimulation (NMES) try to shock the muscles and nerves back into action. Ice can help. Biofeedback training and neurocognitive training, which are designed to challenge the body and mind together, are being explored. And eccentric exercise, where weight is slowly lowered, can recruit different neural pathways to help overcome inhibition.

All of these methods can be effective, and research on them continues. In the scientific community, there’s no singular remedy for AMI at the present moment. Buhler thinks his method, the Advanced Muscle Integration Technique (AMIT) is that magic bullet.

“If you had asked me about it, I would have said they’re all quacks.”

It’s 1984. John Stockton – later a 10-time NBA All-Star, member of the Dream Team, and the league’s all-time assist leader after 19 years as a pro – is a rookie on the Utah Jazz. His teammates, including Thurl Bailey, Mark Eaton, and Adrian Dantley, tell him to see a chiropractor who was working with the team: Craig Buhler.

Stockton saw Buhler at work. Multiple technicians were manipulating a single teammate, pressing in one spot, pulling in another. And the rookie point guard says he responded, “No thanks.”

“I had never had chiropractic care. In fact, if you’d asked me about it, I would have said they’re all quacks,” he says.

Building Long-Term Resilience

David Stewart, too, was skeptical before his first visit to Buhler's office after his knee surgery, as was Picabo Street. When she went to see Buhler for the first time in 2001, she says, "I was kind of naturally a naysayer."

This skepticism isn't unfounded. While chiropractic care has been shown to help with lower back pain, the strength of that evidence is only moderate, according to multiple research reviews. And advocates of chiropractic care tout it as a cure-all for much more than back pain: Asthma, infant colic, gastrointestinal disorders, and even autism. There's **little scientific evidence for these claims**. Even the American Chiropractic Association doesn't list these benefits on its page "**What Research Shows About Chiropractic**."

Buhler is aware of these claims, and the skepticism around chiropractic. On his website, Buhler compares AMIT to "other chiropractors," citing that his method goes beyond "general, standard adjustments." And in an interview, Buhler pointed out that AMIT integrates multiple techniques that go beyond chiropractic care.

"What I'm doing is uniquely different than just basic chiropractic," he says. "We've integrated the best of the physical therapy world, the medical world, and my world."

In an AMIT session, Buhler and at least one other technician press and pull on different parts of the body… sometimes on parts that are seemingly unrelated to the inhibited muscle he's hoping to reactivate.

"The person on your right side might be pushing points on your head and your leg, while the other is pushing another point on your leg plus a point on your abdomen. And they just push on them for three minutes," Stewart says of the treatment. They press hard enough to create discomfort, but not pain. And when they do so, Stewart says, "it seems to be making a connection… like you're connecting an electrical circuit through these three or four points."

The reconnection of that circuit helped Stewart reactivate the dormant muscles in his quadriceps… almost instantly, he says.

Stockton experienced similar results. A few years after his rookie campaign, he gave in to his teammates' suggestions and visited Buhler for tendinitis in his right leg.

"He touched me in five different spots, and I jumped off the table and said, 'what the heck is that?'" the Hall of Famer remembers. Buhler explained his method, and Stockton let him continue. "Five minutes later, I walked out of that office pain-free."

Stimulating Muscles To Turn Back "On"

Buhler began developing his method while studying at Western States Chiropractic College in Portland, Oregon in the 1970s. There, he worked with Alan Beardall, a faculty member, to treat some of the area's elite runners. To try to create more lasting results in the runners they were treating, Beardall and Buhler began researching the field of applied kinesiology and the work of a Detroit chiropractor, George Goodheart.

"[Goodheart] found that each muscle had a vascular reflex point, which helped stimulate circulation. There was a lymphatic point that helped stimulate lymphatic drainage, and each muscle had a relationship with different organs… and then there was an acupuncture point," Buhler says.

The concept was that each of these spots connected to the muscle in a circuit, and if any spot became disrupted, the circuit would break, reducing the amount of muscle contraction for the target muscle. By stimulating all of them at once, Buhler says his method stimulates the muscle to overcome inhibition.

That may be AMI, or another type of inhibition, he says. When tendons are overloaded, for example, the enthesis organ – the place where tendons attach to bone –

can shut down a muscle, he says.

Mechanical stimulation **has shown some promise for fixing enthesis organ issues**, including in the rotator cuff of the shoulder. But the mechanisms by which it works are still being explored.

An Arthrogenic Muscle Inhibition Solve

Buhler believes that the AMIT system reactivates the muscle by reconnecting the broken circuit, almost like putting your fingers on both sides of a battery.

And he believes that most people have muscles that aren't firing at full strength: In a 2017 study he started at the University of Utah, 60 subjects aged 18-35 were tested for gluteus maximus function, and 46% weren't able to do complete contractions of this largest muscle. AMIT was administered to eight subjects, who saw increased hip range of motion and force production from the glute, but the study was halted due to COVID shutdowns.

Despite a lack of double-blind evidence, Buhler's athlete clients say his methods have helped keep them in the game long-term. When Street first visited Buhler's office in the summer of 2001, she had already won two Olympic medals. But in the run-up to the 2002 Olympics in Salt Lake City, she was recovering from a broken femur and a blown-out knee.

"I was experiencing so much pain… I had a limited range of motion in some areas, and a severe lack of strength. I just couldn't gain strength or power," she says. Before her treatments, she couldn't perform a single-leg squat, a movement that should be a cinch for a skier who can hurtle down mountains at 90 mph. "He woke everything up enough for me to be able to recruit all the muscle bellies to do a single-leg squat. I cried like a baby."

Street has continued to see Buhler in the two decades since as injuries pop up. Stockton credits the treatments with his longevity in the NBA: The Jazz star played 19 seasons.

When to Worry About Muscle Inhibition, and When Not To

Even if you aren't speeding down the slopes of Lillehammer or dishing dimes to Karl Malone, your muscles may still experience some level of inhibition as bumps, falls, and strains pile up with age. But that may not be a problem, says Lepley.

"Our bodies are remarkably resilient, and can usually adapt really well to the amounts of inhibition that can come from everyday aches, pains, or minor issues… The good news is that in most cases, the nervous system adapts, the body finds new movement patterns, reduces pain, and restores normal muscle activation," Lepley says of experiencing some inhibition. "I'm of the mindset that if our body compensates in a way where there's no pain, no loss of function, and [our limbs] are doing the things they need to do, then that's our body doing what it's supposed to do. That's a successful adaptation."

Not every compensation is pain-free, though, and inhibition after major injury or surgery may inhibit your lifestyle, like in the case of Stewart's quads. Still, Buhler's methodology may not be accessible to you—he's in Utah, and his treatments aren't cheap… a "20-muscle" package is $1170. And his methods aren't guaranteed for every single patient. If you're worried about inhibited muscles, and that's out of your price range, ask your doctor about orthopedic care, physical therapy, and other options.

Some treatments they may try include:

• Electrical stimulation, like TENS or NMES

• Controlling pain or swelling with ice and cryotherapy

• Physical therapy movements that focus on eccentric, or “lowering,” strength exercises

• Manual stimulation, like massage

It may take time to figure out which method will work best, since the source of each person’s AMI can be different. But neglecting inhibition after surgery or major injury can significantly impact recovery and long-term function. Don’t ignore it.

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