TIMOTHY HEWETT: Basically, the focus of our work is what I call preventive biomechanics. So what we do is we use biomechanical principles, turning the body into mathematics and figuring out the loads and forces on the body under various situations. A lot of the focus is on injury prevention and sports. A lot of our focus has been on the anterior cruciate ligament of the knee. It's the main stabilizer to the knee, and in sports like football and soccer and basketball for example, in the NBA in the NFL, it's the number one reason for time lost for athletes in those sports. So it's highly impactful. And what we've shown, in randomized controlled trials, is that because about 70% of those injuries, even in the NFL are non-contact, meaning they're just due to the way the athlete moves or activates his muscles during landing and cutting, that you can prevent a significant portion of those. And what we've demonstrated in these randomized control trials is that we can actually reduce risk between 1/2 and 2/3. So that's been highly impactful. And we're currently working with the NBA and the NFL and numerous collegiate and high school and even grade school programs, to reduce the risk of injuries.

For example in young adolescent females, they are somewhere between two and 10 times more likely to tear their anterior cruciate ligament than boys and men playing the same sports like soccer, basketball, and volleyball. And what we've demonstrated is that we can screen these athletes and we can actually pick out, with about 70% to 80% sensitivity and specificity, who's at risk of having a future ACL injury. And then we take that information, focus on that athlete's profile, build an intervention program, or sort of a pre-habilitation program, where again, we've demonstrated in multiple trials that we can reduce risk between 50 and say 70%. And we have a good idea of the mechanism and how you tear your ACL.

Basically, the way you tear your ACL is like this. So if this is my fibula, that's the outside of my knee, you have a combination of rotations that occur like this. You have what's called an abduction of the distal tibia combined with an anterior translation of the lateral tibia, internal rotation, and the ligament ruptures. And we've demonstrated that through computer models, through cadaveric studies, through in vivo studies, actual videos of people tearing their ACL. So anything we do that can limit those three rotations together can decrease your risk of tearing that ligament. And that's what we do, we deal with neuromuscular imbalances that lead into that kind of rotation around that joint. Again, what we do is focus on the hips and pelvis, making sure that an athlete activates their gluteal muscles, the biggest most powerful muscle in the body that resists that dropping in of the hip and the internal rotation at the knee.

The way it happens is the knee starts out relatively straight and the foot hits hard on the ground, there's a high ground reaction force. What occurs is the force, instead of being dissipated by the musculature, it's felt at the joint and it's absorbed at the ligament, which ruptures. We teach them to land and roll their foot so there's not a high ground reaction force, that we teach them to flex their hip and their knee. We teach them to be less anterior dominant and more posterior chain dominant, to turn on those hip muscles, the core muscles, to control the position of the center of mass where the ground reaction force is coming towards, so that the center of mass stays within the plantar base of the foot. Because when it goes outside that foot base, the ground reaction force goes lateral to the hip and knee and collapses the knee in and rotates it.

So those are the basic techniques we use. And we do a lot of plyometric, high-intensity jump type training that really activates posterior chain. And we give the athlete a lot of feedback, to teach them to control the hip and knee and ankle and foot in a way that's going to dissipate force and actively dissipate force at the muscle rather than allowing it to go to the joint and to the ligament. The good news is that these neuromuscular imbalances are adaptable, we can alter them. And we've demonstrated that both in the lab and on the field.

So the good news in this is that profile can be altered, that that high-risk profile can be brought down to a significantly lower risk within the range of 6 to 10 weeks of training. It is applicable to the everyday athlete for multiple reasons. We've also shown the most common injury that people get is overuse injuries like knee pain, what we call patella femoral pain, pain behind the knee cap. The same neuromuscular imbalances that lead to that acute rupture of the ACL also lead to overuse, injury, and wear and tear at the patella and at the knee joint. So it's also been demonstrated, in randomized controlled trials, that using these techniques to correct these neuromuscular imbalances decreases the risk of a knee injury, overuse injury, and everyday athletes.

It used to be thought, this idea that the risk of tearing another ACL was only like maybe three to 6%. What our latest data shows is if you're young, athletic, particularly if you're female and you're going back to the same level of sport, your risk is somewhere between 20% and 30% over just the first two years. So what we're doing is we're developing this randomized controlled trial to see if we can use similar techniques geared at a specific athlete's neuromuscular imbalances. Can we use these pre-habilitation on top of rehabilitation techniques to reduce the risk of a second ACL tear, which can be absolutely devastating to an athlete.

I think the exciting thing is we know that this works. We know that we can reduce relative risk. What we need is people to implement this. We need physicians, physical therapists, other clinicians to get this out there to both healthy people and to their patients, because we know the efficaciousness is quite high. Now we need it to be implemented.