

Wellness Center program opens doors to metabolic fitness

Sports Performance Not Just for Elite Athletes Anymore

By Todd Neff

The yellow jersey, one of four gracing the walls of the Anschutz Health and Wellness Center's Human Performance Laboratory, hung in a frame right above Kevin Nicol.

Three of the jerseys were from pro cycling teams grateful for the performance boost Iñigo San Millán, PhD, had helped them gain. The fourth was marked with a single signature. *Para Iñigo*, it began. It was from Alberto Contador, the Spanish cycling great and one of only five ever to win the triumvirate of cycling's grand tours – the Tour de France, the Giro d'Italia and the Vuelta a España.



Kevin Nicol, a professional research assistant with the Anschutz Health and Wellness Center's Sports Performance Clinic, works the numbers as Robert Jones warms up prior to metabolic testing in the center's Human Performance Laboratory.

Clearly, this was the domain of elite athletes. Beneath the framed jersey, Nicol, a Wellness Center professional research assistant, worked on a computer, establishing the numerical framework for a metabolic fitness test. Nicol would track heart rate, blood lactate, carbohydrate and fat oxidation, oxygen consumption and respiratory exchange rate for the rider who was warming up.

That was Robert Jones, who pedaled on a stationary bike in the corner. Jones is fit – six-foot-three, 187 pounds, with 14 percent body fat, according to the calipers Nicol applied to various skin-folds – but he is also 52 years old and a development officer for a nonprofit, not a professional athlete.

That Jones now pedaled the same bike as pro cyclists and hockey players, Olympic endurance athletes and University of Colorado football and basketball players is a big part of what sets the Wellness Center's Sports Performance Program apart.

"We have the same facilities as you have at the Olympic training center in Colorado Springs," San Millán said. "The difference is that you don't have to be an Olympian to come here."

World class. As the Contador jersey suggests, San Millán and his Wellness Center team are recognized as being among the world's best at assessing human performance and tweaking training and nutrition plans to maximize it. So why bother with a "regular Joe," as Jones describes himself?

"There's a huge boom not only in the U.S., but around the world in this population," San Millán explained. "Every single marathon, triathlon, fun run, cycling event – there's record-breaking participation. Before, it was running around the park or with friends. Now they have evolved into competitive athletes, but they don't know how to train, how to eat. They overtrain. We're seeing the same injuries as in elite and professional athletes. So we figured we really have to open the lab."

Jones said he just wants to improve.

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"I did races a couple of years ago and wanted to take my abilities to a higher level," he said. "The big attraction is I simply want to get better at it, and at 52 to be able to push my body to see what I'm capable of."

He had plenty of other options. Online coaching is booming. He could have self-assessed, too – the various [training zones](#) aren't hard to find online. What these approaches lack, though, is a way to nail down precisely where an athlete is, performance-wise, and use that information as a basis for a tailored training program.

"There's no physiological testing," San Millán said of other training programs. "It's not very scientific. We have an alternative based on experience we have been developing with world-class athletes."

Lactate is key. To some extent, this is a royal "we." The testing methodology is to no small degree the product of research work with roots reaching back to San Millán's doctoral thesis on lactate metabolism. San Millán's interest in sports performance stemmed from his own athletic experiences. Growing up in his native Spain, he played soccer in the ranks of Real Madrid, one of Europe's great clubs. He switched to cycling, eventually spending two years as a pro. He came to realize that training protocols were inefficient, and he started developing his own.

Understanding and optimizing lactate metabolism is at the heart of the Sports Performance Program. It's why Jones pedaled against increasing resistance wearing what he described as a "fighter-jet mask" that sent his breath through a ParvoMedics TrueOne 2400 Metabolic Measuring System. It's also, indirectly, why Nicol pricked Jones's earlobe for drops of blood as Jones pushed through rising resistances of 123 watts, 176 watts, 218 watts, 268 watts, and 305 watts.

Why measure lactate metabolism? Lactate, San Millán explained, is a byproduct of glucose utilization in exercise. When lactate accumulates, the hydrogen ions associated with it increase acidity in muscle cells and brings about acidosis, which interferes with muscle contraction, makes you tired and saps your performance. The higher the intensity, the more glucose muscles use, and the more lactate needs to be cleared out of those muscles.

"The one who clears out lactate the best is going to be most efficient," San Millán explained. "Not just in endurance, but also in high-intensity sports."

Fat vs. Glucose. Figuring out lactate clearance takes some serious science, and that's why Jones was on the bike. Nicol was using Jones's blood and breath to understand what his muscle cells were eating, in effect. That depended, in part, on what types of muscle cells were dominant. Slow-twitch fibers are aerobic (oxygen-dependent), and burn fat. Fast-twitch fibers, of which there are two types – one aerobic, one anaerobic – prefer glucose.

Wanton glucose burning, remember, can lead to acidosis. Glucose stores in the body are also limited – maybe 1,800 calories in an adult. On the other hand, even thin people have fat in relative abundance – just a kilogram of it holds 9,000 calories, about 50 percent more than riders like Alberto Contador burn on a six-hour Tour de France mountain stage. So you can't really run out of fat during a bout of exercise.



Nicol, left, racing up Mount Evans in 2007. Boulder cyclist Tom Danielson is to his right. Danielson won the climb that year; Nicol won it two years later. He remains a competitive cyclist, practicing what he preaches with respect to a focus on metabolic fitness.

"Fat is like diesel fuel in your body," Nicol told Jones. "Carbs are like fuel for the turbocharger."

So the key to metabolic fitness, San Millán found (and Contador and many others have come to appreciate) is to boost an athlete's aerobic base – in other words, to develop training regimens that help an athlete work harder and harder without relying as heavily on fast-twitch, glucose-burning, lactate-producing muscle types. With the aerobic base solidified, the program boosts the athlete's ability to engage fast-twitch muscle fibers without heavy lactate build-up.

Results are in. Nicol, 46, a pro cyclist himself who trained under San Millán, counts as another of many testaments to the method's

effectiveness. He recently rode his bike up Lookout Mountain in 17 minutes, which recreational cyclists who have struggled up that slope will recognize as inhumanly fast.

But San Millán's approach works for all sorts. Jim Ellis, the Wellness Center's director of operations, said half the clinic's clients are what he described as "serious weekend warriors."

"One guy had been doing marathons for 25 years," Ellis said. "We were able to improve his marathon time by an hour."

But what about the conventional metrics like VO2 max, a traditional measuring stick for fitness that establishes the maximum amount of oxygen a person can deliver to muscles during exercise? Jones had that measured, too. But it's not nearly as telling as lactate-based measurements, explained Nick Edwards, the Sports Performance Clinic's assistant director.

Edwards described a 32-year-old male cyclist who went through the clinic's testing and a training program San Millán designed. The cyclist's VO2 max number improved by just one tenth of one percent during the program. But his lactate clearance improved to the point that what had been a fast-twitch, acidosis-heavy pace turned into a purely aerobic, sustainable ride.

"We're looking at seeing someone's metabolism change at a cellular level," Edwards said.

Get with the program. Jones got "a very extensive set of charts and graphs – I mean a lot of information" from Nicol a couple of days after the test.

"It's pretty interesting. You can see the fat and carb oxidation rates versus heart rates," he said. "And at a certain heart rate, the carb oxidation rate just starts to skyrocket."

Nicol took the data and extrapolated heart rate thresholds for training purposes. For about six weeks, he'll have Jones work at the top edge of Zone 2 – a steady, aerobic pace.

"It's not a walk in the park. It's fast enough that you have to think about it," Nicol told Jones. Once the density of the slow-twitch, fat-burning cells increases, Jones will start pushing harder. A follow-up metabolic test in the Human Performance Lab in six months will help fine-tune the training program to his increasing

fitness levels.

Jones looked through the metabolic-fitness data and the exercise program and wrote Nicol a quick email.

"My one regret," Jones wrote, "is not crossing paths with you two years ago."

For more information on the Sports Performance Clinic and its programs, visit

<http://www.anschutzwellness.com/sports-performance>.