



A C Milan – In The Mind Room

How Neurofeedback helps the European Soccer Champions

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Wired for victory

Can a bunch of electrodes and a computer screen help you swim faster, sink your putts, and swish your free throws? By D.T. Max

hooking up With neurofeed-back, athletes train their brains—and get a jump on the competition.

A quiet mind is a winning mind.

That's why the players of the Italian soccer team AC Milan gather every two weeks in the Mind Room, a glassed-in facility at the team's chic training complex. There, on zero-gravity recliners, listening to the soothing sounds of New Age music, they unwind. In a way. Each player's head is fitted out with miniature electrodes that send a signal from his scalp to a computer, so while he relaxes he can also watch his brain waves play out, like a video game, as brightly colored zigs and zags on a monitor.

Every once in a while, an aberrant wave pattern flickers across the screen. The penalty kick missed against Juventus? Anger at being benched? When these sudden spikes appear, the player's job is to use all of his mental discipline to banish the discordant thought—the anxiety response of the brain to a negative memory—and return to a neutral, open state, optimal for performance. Behind a wall of glass, the team's sports psychologists watch the zigzagging

lines too, the alpha, beta, and theta waves of the human mind in action, evaluating their stars' focus and occasionally sending calming words through their earpieces.

This procedure is called neurofeedback training. Many athletes swear by it and say it improves their performance, among them the tennis champion Mary Pierce and the Olympic gold-medal skier Hermann Maier, not to mention various players on the 2006 World Cup champion Italian soccer team. The goal of neurofeedback, which is becoming increasingly popular for professionals and amateurs alike, is to train the brain so that an athlete stays focused in competition. Experts have shown that a state of calm neutrality can help players perform better. The idea is that we damage ourselves when we can't get past our irritations and, especially, our remembered failures—our airballs, unforced errors, or pushed one-foot putts. Think of Chuck Knoblauch, the Yankee second baseman whose first surprising throwing errors in the late 1990s started a negative feedback loop—ball after ball sailing into the stands until the former Gold Glove prematurely retired after the 2002 season. Neurofeedback tries to block this downward spiral of self-destructive doubting. When it works, it helps the player find "the zone" and stay in it. The notion that freedom from stress will make you a better athlete is hardly new. "You must swing smoothly to play golf well and you must be relaxed to swing smoothly," Bobby Jones said decades ago. Thinking has always been stinking. But two things have changed since Jones's time to make interventions like neurofeedback feasible. We can now define a relaxed state of mind with precision, and we seem to have proof that, once relaxed, the brain can be taught to stay that way.



The history of neurofeedback goes back to the Russian physiologist Ivan Pavlov and his conditioning experiments with dogs. Then, in the sixties, the sleep researcher Barry Sterman found that he was able to train cats to produce a particular brain wave called a sensorimotor response (SMR), which created a kind of suspended focus, a feline version of "the zone." Sterman would go on to help found the discipline of neurofeedback in the seventies at UCLA, when EEG machines—electroencephalography is the grandfather of the discipline—were as big as refrigerators, with electrodes like suction cups. Today, the standard neurofeedback EEG amplifier is no bigger than a USB hub and the electrodes look like the earbuds from an iPod. A coach can carry a neurofeedback kit in his bag and clean up a player's mind in a hotel room or at halftime. As a result, neurofeedback is going on nearly everywhere.

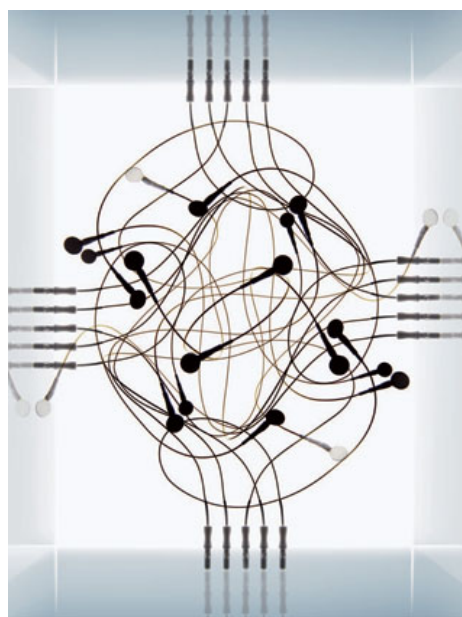
Neurofeedback techniques vary, but all the protocols depend on this: The brain tells its tales in the wavelengths of electrical currents—alpha and SMR (relaxed openness and focus); beta (multitasking efficiency, but also anxiety and self-talk); and theta (wandering mind). The core tenet of neurofeedback is that, with training, the underlying processes that result in brain waves can be modified at the behest of their possessor, improving performance and function.

At the Mind Room, which is run with Opus Dei-like secrecy (my request to give it a test spin wasn't so much denied as smothered by layers of bureaucracy), soccer players like to choose a user interface in which they try to make an animated robot run. Afterward they compare speeds—in effect, the player with the most alpha and fewest beta and theta waves wins. But a curious thing about neurofeedback is that one does not improve by trying to improve—at least not directly. Type-A personalities be warned: One cannot simply power one's way to a quieter mind. In a book by Jim Robbins called *A Symphony in the Brain*, Sterman describes

the ideal neurofeedback condition as "a standby state for the motor system. You might think of it as a VCR; it's a pause button." A typical neurofeedback treatment lasts for roughly 20 to 40 sessions of an hour each, and then—so the theory goes—the patient has permanently changed the makeup of his mind. He can now hit "pause" at will.

As I began looking into neurofeedback over the past year, it did seem to me that perhaps the mind really can be shaped into an incredibly cooperative and flexible instrument when its possessor is motivated. I read in *Gazzetta dello Sport* that AC Milan defender Dario Simic, who scored a clutch goal against Argentina in last summer's World Cup, said he owed it all to the Mind Room. Then later at the Washington, D.C. area office of a practitioner named Deborah Stokes, I ran into a Morgan Stanley wealth manager who claimed that since he'd started neurofeedback his tennis game had soared. "It's as if the ball had slowed down," he told me. "It's just very clear that I expect to win." That convinced me. The money guy hadn't even gone in for sports training—he'd gone because of concentration problems at work.

The idea that I, too, could gain a competitive edge without steroids, supplements, or endless practice seemed appealing. I am an avid swimmer, although one beset by repeated injuries that have made it increasingly hard to enjoy the sport, let alone truly excel at it. On Italian TV, the head psychologist of the Mind Room had said that the difference between the stress felt by great athletes and ordinary ones was "quantity, not quality."



My first stop was with Ray Pavlov, a neurofeedback practitioner in Montreal. He and his wife, Nicolina, have trained many of Canada's practitioners. I had expected to be in a large sanitized environment, a Canadian version of the Mind Room. Instead, the Pavlovs work out of three tiny rooms above a bagel store. I had been told that Pavlov was the grandson of the famous physiologist, but he was evasive on the point.

For the current Dr. Pavlov, a former oncologist, neurofeedback is more than just, say, a toy for winning the gold in Beijing next year. It represents the possibility of subverting what he called "the official mentality of pills and hip replacements." I got the impression that, for Pavlov, neurofeedback is like a better version of homeopathy, prayer, or meditation—

better because it can be quantified. "We can teach you how to go into alpha objectively," he told me with quiet, doctorly certainty.

Soon Pavlov's wife, Nicolina, had me under a chenille blanket in a large chair behind a chenille curtain. The scene was very MittelEurope. I expected Harry Lyme to pop out to zither music.

Nicolina attached clips to my ears—one electrode on the top of my head and another on my forehead—and I began to watch my brain on a TV screen. It is a strange sensation the first time you see your mind looking like, of all things, a video game. My strengths, weaknesses, phobias, and obsessions all opened up as a riot of digitalized pulsing bar graphs—pinks, reds, and blues all racing toward nothing. Nicolina had also connected sensors to my index finger and around my waist to measure heart-rate variability and respiration. She taught me—successfully—how to raise my body temperature by imagining that my hands were in hot water: Because athletes are more relaxed, she told me, they have higher peripheral body

temperatures than nonathletes. She next tried to show me how to get my breathing and heartbeat in sync, something many athletes can do. Then we worked on getting my beta down and my alpha up, but with limited success. "Chatterbox beta," she tsked me. She showed me my shameful beta-to-alpha coefficient on the screen. It was 30 percent above average. "Writers, people like you, always have the chatterbox brain."

Practitioners say that neurofeedback could potentially improve not just our athletic skills but our professional ones—our sense of organization, how we deal with setbacks, even how we respond when the kids refuse to go to bed. Who would not want a quiet mind on demand? But performance is notoriously hard to measure. The intervention of the neurofeedback practitioner, critics say, is itself often sufficient to bring about improvement. In other words, the placebo effect of just walking into the Mind Room might be enough to make a Milano striker play better. Even Sterman urges caution. "I think neurofeedback is a powerful tool," he told me. But what is still needed "is more research funding in order to get academic labs involved instead of clinicians trying to make a living." Even so, all over America athletes have been quietly training their brains. Almost none will talk about it.

I asked the premier manufacturer of the equipment why. "They don't want their competitors to know they do it," Larry Klein, cofounder of Thought Technology in Montreal, told me. "Because then they would do it too, and take away their advantage." By some estimates there are thousands of neurofeedback practitioners in North America. Many treat epilepsy and attention deficit disorder (sometimes covered by major insurers), while others devote at least part of their practices to improving clients' sports, artistic, or business skills.

The day after my session with the Pavlovs, I found myself at a tennis club outside Toronto in Burlington, Ontario, with Sue Wilson, a top neurofeedback sports expert and a professor of health sciences at York University. A Canadian tennis coach, Pierre Lamarche, had asked Wilson to come and evaluate a young tennis hopeful. Nineteen-year-old Katy Shulaeva had twice been Canada's National Junior Champion, and on Lamarche's Web site she had written that her dream was to be "the number-one player in the world." At the moment, though, she was No. 400.

That is not to say she wasn't good. I watched her practice against another one of Lamarche's teen protégées. To my eye, they looked evenly matched. But their coach did not think so. "If they played, Katy would beat her easily," he told me. And when I looked again, I could see what he meant. Katy's strokes were good, but her game was even better: Everything was natural and nothing caused her excitement. She was like a zebra bounding through a savannah.

The question before Katy's handlers, then, was, Why wasn't she getting better results in competition? Lamarche thought it might be because she had had several recent injuries, and the aim that day was to see whether they had affected her brain or body or both. Wilson put her in a chair in the club's offices and hooked her up. Katy, it turned out, could easily do what I hadn't done at the Pavlovs—match her breathing to her heartbeat. It made me wonder if athletes have some kind of innate concentration advantage. The graphic Katy had chosen was a bay of blue water. The tips of the waves shaded toward pink, but the goal was to keep everything blue. Her skinny body lax, Katy seemed to be looking at nothing and everything. Her eyes were glassy and her mind seemed distant. Wilson and I talked across her with no effect: Only Lamarche's praise tinged the waves pink—how players crave the love of their coaches, even it distracts them from the task at hand! But in no time Katy got right back into blue.

According to some studies, the ability to shift attention quickly is an optimal state for athletes, because the most mentally fit are the ones who can recover the fastest from short bursts of intense concentration. Watching Katy, I felt I wasn't just learning about neurofeedback, but how a well-conditioned athletic brain actually works. "I don't even know how I do it," she said. I thought of John McEnroe, how his tantrums gave way so suddenly to complete concentration on the court that many thought the anger itself was faked to intimidate umpires and opponents.

Katy's test impressed me. Her mind was pretty quiet, so Wilson and Lamarche came to realize that her problems were physical and decided to add a large dose of sports massage and yoga to her regimen. So, in this case, neurofeedback helped identify an area where an athlete needed additional training. Now, as Katy left with a friend to go see Borat, it was my turn. With Wilson's help, I gradually figured out how to lower my thetas by quieting the images in my mind and focusing on getting a flower to open on the screen. Anytime I let other thoughts wander into my mind—my flight home, my children, how much I wanted to beat Katy at neurofeedback—the flower would stop opening. But I soon became adept at returning to zoning out and making the petals open. Wilson was pleased and I was pleased.

Now it was time to swim.

I knew I had not done enough neurofeedback to permanently alter my brain, but I had tried it three or four times and expected to experience some change—a quieter mind, at least. Ever since I endured my overuse injury several years ago, I have spent much of my time in the pool worrying about aggravating the hurt shoulder.

I lowered myself in. Without a computer monitor to guide me, the effort to keep my mind quiet was a bit challenging. I tried to copy the way Katy had seemed to empty out her brain. I had noticed this emptying with other athletes too—how, say, the hours on the exercise bike just seemed to drip off them—and had always associated it with a lack of, well, intelligence. But now I understood it to be, in fact, an asset that one could acquire. As I warmed up by swimming the crawl, moving back and forth through the water, I felt a familiar light joyousness in my body. Whenever the thought of my shoulder came up, I envisioned instead speeding waves of alpha carrying me along. I swam faster, enjoying the liberating mindlessness of it. I imagined that from above I looked quite sleek—and then banished the thought. My flower was opening in a pageant of pink, yellow, and green.

I had planned to swim for maybe half an hour, and at about lap 20 something occurred. I was no longer alone in the water. A dolphin was leading me. No, seriously. It seemed weirdly logical—his body undulating like a brain wave. I followed my imaginary mammalian companion with pleasure. He was so fast that he lapped me every 20 or so seconds, but I trailed in his wake, arching and turning and flipping in my mind as I churned in the pool. Every so often, I would hear in my head a distinct ding—the positive audio reinforcement that rewards open concentration during neurofeedback sessions. Had my mind achieved that ideal state of pausitude, or was I somehow just mistaking having an unruly mind for having a quiet mind? But neurofeedback requires a suspension of doubt: No more chatterbox brain!

After my half hour was up, I got out of the water. The dolphin was gone. I looked at my watch. I had broken my previous best and my shoulder hurt like hell.

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