

# MUSCLE MEMORY—THE EDGE OF INSTINCT

by Don Mitchell

There is such a thing as muscle memory. In the intricate sensations and movements of music, as in sports, this capability of automated or semi-conscious activity becomes very important. In the baseball player's choice to swing or not swing, in the hockey player's selection of a corner of the goal to shoot for, and in the violinist's resolution of a 20-note trill, we find a combination of enervation and movement that cannot wait for ordinary thought. These reactions must be so thoroughly rehearsed that they are natural, inevitable, and absolutely dependable. They must be "hard wired."

If you are uncertain whether such movements exist, watch Venus Williams drive a forehand ground stroke in a tennis match, watch Joe Mauer guide a baseball to the gap in left center field, or watch Hilary Hahn negotiate the *Praeludium* to Bach's third partita for unaccompanied violin. If there is such a thing as perfection in human movement, these instances surely approach that standard. They are not and cannot be completely automatic. They are determined in part by conditions of the moment, and are touched by the emotions and intentions of the actors. They are also largely spontaneous and reflexive, free from what we would usually call consideration.

It is ironic to take thought *out of* a dramatic cognitive challenge, but that is precisely what we do in training for these and other demanding motor responses. Call it muscle memory, autopilot, "in the zone," call it a trance or the subconscious; most of us have had this experience. The essence is a suspension of ordinary consciousness while performing—in fact many people report the necessity of *suppressing* ordinary thought *about* the performance. To think about it would undermine the trained and long-practiced response, possibly leading to failure.

In *The Game*, a perceptive book about ice hockey, Ken Dryden examines the background of "the special player." Himself a Hall-of-Fame goalie for the Montreal Canadiens, Dryden describes teammate Guy Lefleur, a perennial all-star and scoring leader (the italics are Dryden's):

... A special player has spent time with his game. On backyard rinks, in local arenas, in time alone and with others, time without shortcuts, he has seen many things, he has *experienced* the game. He understands it. There is *scope and culture* in his game. He is not a born player. What he has is not a gift, random and otherworldly and unearned. There is surely something in his genetic make-up that allows him to be great, but just as surely there are others like him who fall short. He is, instead, *a natural*.

"Muscle memory" is a phrase physiologists sometimes use. It means that for many movements we make, our muscles move with no message from the brain telling them to move, that stored in the muscles is a learned capacity to move a certain way and, given a stimulus from the spinal cord, they move that way. We see a note on a sheet of music, our fingers move; no thought, no direction, and because one step of the transaction is eliminated—the information message loop through the brain—we move faster as well.

When first learning a game, a player thinks through every step of what he is doing, needing to direct his body the way he wants it to go. With practice, with repetition, movements get

memorized, speeding up, growing surer, gradually becoming part of the muscle's memory. The great player, having seen and done more things, more different and personal things, has in his muscles the memory of more notes, more combinations and patterns of notes, played in different ways. Faced with a situation, his body responds. Faced with something new, it finds an answer he didn't know was there. He *invents the game*.

For comparison, consider Pierre Baillot's ambitious 1835 book *The Art of the Violin*, where he discusses the merits of playing a piece from memory as opposed to reading the music. Memorization, he concedes, creates a favorable impression on the listener: *The virtuoso has more power over his audience if he appears so imbued with what he is going to say that nothing physical (i.e. the printed music) is required to remind him of it*. But Baillot is aware of a disadvantage as well:

...it requires much repetitive practice on the same piece until the violinist can, so to speak, rely on the memory of the fingers rather than on that of the mind; this gives technical matters more power than they should have, and permits them to command instead of obey when inspiration might lead the player to do something unexpected.

Despite this, Baillot goes on to say:

...these disadvantages disappear when the violinist plays without accompaniment; with good training and habit he can become a good improviser, and can more easily make up for some inexactitude or lapse of memory.

In fact, near the end of his 500-page book Baillot describes the condition of the expert player as freedom from mental exertion:

...Here no more thought, no more calculations; the artist gifted with superior talent has made such a habit of subordinating his playing to the rules of the art that he follows them without study or trouble...

So it would seem that a complex behavior, carefully studied with exhaustive repetition, eventually becomes muscle memory—that is, reflexive, consistent, reliable, and without guidance from the intellect. For example, the concept of the fourth position on the violin exists only in our minds. It manifests itself in the feel and execution of notes at exact points on the strings of the violin, but the mature player no longer needs to "think" fourth position in order to play those notes. Similarly, Joe Mauer probably does not need to think "inside and low" in order to hit a pitch that happens to come in that way.

Study and repetition create a path, albeit tortuous and labor-intensive, whereby a complex movement is developed and lodged in muscle memory. After exhaustive training, the behavior is largely reflexive, unguided or little influenced by conscious thought. Still, there are evident, demonstrable differences in the degrees of proficiency obtained by different students. There probably are many individuals whose dedication and enthusiasm for the practiced activity approach Joe Mauer's. I make no claims for baseball, about

which I know little. But every string teacher knows there are significant differences, sometimes huge differences, in the development of individual students who were given the same training materials, had similar parental support, invested comparable time and energy, and had the same desire to succeed. As educators, we like to discount the notion of inborn or innate talent, sometimes called giftedness. But we all acknowledge that there is such a thing, and it matters.

Here is where we reach the edge of instinct. Joe Mauer was not born hitting .350. He worked very hard over a long period of time, with ingenious parental instruction and superior coaching. He was blessed with size and strength, which he enhanced through diet and physical conditioning. I submit that along with the physical characteristics of his body, Joe inherited something else. It is not exactly a talent, nor a gift nor a propensity. It is very close to an aptitude, if that word is carefully and narrowly defined. It is physical, and it must reside in the chromosomes.

Here at the edge of instinct, we find ourselves up against the nature/nurture conundrum. A very strong case can be made for the importance of environment in Joe Mauer's childhood, an environment that led in part to his fantastic athletic success. It did not hurt Wolfgang Amadeus Mozart's career to have been born into the home of the world's authority on violin teaching. Had these two individuals been born to Inuit or Pacific Island families, they might have become great in some other important endeavor, but they would doubtfully have found either baseball or the violin. Taking nothing away from their prodigious successes, it seems certain that Mauer came pre-loaded with baseball aptitude, and Mozart with musical aptitude. It is the *combination* of aptitude and environment, along with excellent coaching and plain hard work, that yields successful performers like these.

In the process of training students for performance on the violin, we spend a lot of time driving very specific, subtle behaviors into the domain of muscle memory. This takes thought, care, and repetition (more for some students than for others, but hard work and careful attention to detail for all). Through scales, trills, through the famous etudes of Sitt, Kreutzer, Rode, Dounis and Dont, we push specific actions into this beyond-conscious repository. We are helping the student build an internal monument, invisible but as real as a structure of brick and mortar, that will eventually manifest itself in musical performance. The differences our students display in the development of these monuments reflect the efforts they bring to their studies, our skills as teachers, and their genetic inheritance.

Part of our responsibility to students is to help them select the most important musical movements to drive into muscle memory. Initially, at least in left hand development, we are focused on the placement of the fingers, typically in first position. Teachers and students seldom think about this, but in fact the student will have made enormous progress when an F# is played reliably in tune. We then move on to other abstractions—the “positions” as we call them—nothing more than mental constructs that help our

students negotiate the real estate of the fingerboard. (Try showing a non-string player what we mean by fifth position!) Right-hand technique, arguably more subtle, is carefully nurtured through the study of varying bowing styles and through much time and work with double-stops.

In all this we equip the student with some of the basic movements, some of the intellectual infrastructure, that will support a mature technique. Our students have to know how to trill; they have to be able to play in second position—this and so much more has to be instinctual, or at least without deliberate thought. Our obligation extends beyond the specific choices of movements—we must teach the student how to identify and then learn new technique, *in the absence* of our advice and help. This learning, this driving of specific skills into subconscious muscle memory, is the student's monument under construction, in tiny increments with every practice session, every orchestra rehearsal, every lesson, every performance. We can guide the design, but the student has to do the work, and there is no shortcut.

Dryden's “natural” hockey player may be the equivalent of the violinist we are trying to help along the way. Here again are Dryden's phrases, slightly re-worded for consideration in the musical context:

“...in time alone and with others, time without shortcuts, [our student] has seen many things, he has *experienced* [music]. He understands it. There is *scope* and *culture* in his [performance]. He is not a born player. What he has is not a gift, random and otherworldly and unearned. There is surely something in his genetic make-up that allows him to be great, but just as surely there are others like him who fall short. He is, instead, *a natural*... The great player, having seen and done more things, more different and personal things, has in his muscles the memory of more notes, more combinations and patterns of notes, played in different ways.”

We want musical performance to appear “natural,” as with Dryden's hockey player. We want our students to “invent the game.” If we support them with good advice, with high but realistic standards, with a commitment that matches their own, we can justifiably take pride and satisfaction in the artistic monuments they are able to build.

*Don Mitchell is a violinist, teacher and writer who teaches all ages of violin and fiddle in Chisago City, Forest Lake, Marine on St. Croix, Scandia and Stillwater. A long-time Twin Cities resident, Don was a member of the first class of string students in Wayzata schools and a charter member of the Metropolitan Youth Orchestras (the forerunner of GTCYS). His short book The Magic Box will be published by ASTA within the next few months. For inquiries about his writings and workshops with school orchestra groups, contact Don at river-notes26@gmail.com. ‡*