



Sensory Motor Amnesia

WHAT IS SENSORY MOTOR AMNESIA, AND HOW IS DIFFERENT FROM MUSCLE MEMORY?

You are probably familiar with the concept of *muscle memory*. When we repeat a movement like swinging a golf club over and over, the neurons involved in controlling that movement develop increasingly stronger connections. Existing synapses begin to fire more efficiently, and new synapses are formed as well. As a result, our golf swing becomes more automatic, reliable and forceful the more often we practice. We develop what is known as muscle memory.

Despite what the term implies, muscles have no memory of their own—they are controlled by the nervous system. Initially, both voluntary and reflexive movements occur and then cease completely; once we decide to stop moving or the stimulus triggering the reflex is removed, our muscles stop contracting and our body comes to rest. However, when we perform a voluntary movement many times, or if a reflex is stimulated repeatedly, our nervous system notices.

Our nervous system likes to be as efficient as possible, because making fast decisions helps us survive. When our nervous system notices that we keep repeating the same movement or posture, it begins to make that movement or posture automatic. As the muscular pattern becomes more deeply learned, our brain starts keeping the muscles involved in that pattern partially contracted all the time. The control and memory of the pattern shifts to different areas of the brain, allowing the parts of brain responsible for making voluntary decisions to focus on new things which require conscious attention.

The process of developing muscle memory is not limited to athletes, nor is it limited to the learning of complex movement patterns like swinging a golf club. The same learning process is going on all the time within your nervous system, every day of your entire life, even if you sit at a desk all day and go home and watch TV at night.

Some people consciously choose to work with their muscle memory, actively training and retraining their muscular patterns in pursuit of a goal. But most of us are unaware that that we are engaged in a constant process of subconsciously reinforcing old movement patterns and learning new ones.

This automatic learning process is innate in all of us, and it serves an important evolutionary purpose. You can imagine how critical muscle memory was to our survival hundreds of thousands of years ago. Back then, only the fit survived, and the ability to move quickly and automatically under stress often meant the difference between life and death.

For most of us today, our survival is not so dependent on being able to move quickly. However, the process of learning and automating muscular patterns is hardwired into our nervous system, so it occurs whether we want it to or not. For the most part, acquiring muscle memory is enormously beneficial, allowing us to move through our daily life efficiently without having to think about mundane tasks like how to brush our teeth or prepare breakfast.

The key to avoiding problems is that we need to be aware of when we are developing muscular habits that might damage our body or lead to chronic pain. Since our nervous system wants to help us be as efficient as possible, it will remember any movement or posture that we choose to repeat – even if the movement or posture is unnatural and could potentially cause pain and damage over time.

This brings us to the concept of *sensory motor amnesia (SMA)*. Thomas Hanna coined this term to describe the **loss of sensation and motor control that occurs as we learn muscular patterns**. As we learn a movement or posture, not only does the control of that movement or posture become automatic and involuntary, but we lose sensation of the movement or posture. Our proprioceptive and vestibular systems gradually adapt so that we are unaware that the muscular pattern is even occurring.

For example, if we sit slouched forward at our computer day after day, our nervous system learns to keep us in that slouched posture by keeping certain muscles contracted, and our proprioceptive and vestibular systems allow us to get more and more comfortable in this unnatural position. Slouching forward begins to feel normal and even good, and sitting up straight takes effort and feels uncomfortable. We typically remain blissfully unaware of this subconscious adaptation until, one day, it finally causes us pain.

So, sensory motor amnesia describes the negative effects of developing muscle memory; the state in which we have lost sensation and voluntary control of a movement or posture because it has become so deeply learned.

HOW AND WHY WE DEVELOP UNIQUE PATTERNS OF SMA

Most of us are born with perfectly aligned posture and the same innate ability and potential to sense, move and learn. Yet throughout the course of our lives, we each develop such unique muscular patterns that it is hard to believe we all started in the same place.

The Effects of Repetitive Daily Activities

We've already talked about how repetition of a voluntary, conscious movement pattern leads to that pattern becoming automatic and subconscious. There are countless examples of repetitive activities that we do in our daily lives – brushing our teeth, talking on the phone, working at a computer, carrying a bag, working on an assembly line, and lifting heavy objects – that lead us to develop habitual ways of using our bodies.

In doing each of these seemingly simple activities, we make small adjustments to our posture and movement. Over time, these small adjustments become so deeply learned that it may feel impossible to do any of these simple activities in a different way. Try carrying your bag on the opposite side, or changing your baby's diaper with your baby's head at the opposite side. You may feel as though you are physically incapable of doing it, or at the very least you will feel terribly uncoordinated.

These habits may not seem like a big deal. However, carrying a bag on the same shoulder every day of your life can cause the postural adjustments involved to become so deeply learned that you stand and move that way all the time: one shoulder pulled up and back, spine twisted to one side, and rib cage and weight shifted to the other side. As you use your body in that same way while doing other activities, the patterns become even more habitual and the muscular contraction involved becomes more extreme. Over time, the cumulative effects of how we use our bodies while doing simple daily activities can add up to chronic tightness, pain, dysfunction and structural breakdown.

The Effects of Personality

Our personality – the unique combination of emotional and behavioral characteristics that make us who we are – causes us to adopt certain postures and movement patterns.

Research has shown striking correlations between posture and extraverted versus introverted personality traits. Extraverts are approximately 90% more likely to stand with their pelvis straight up and down (in “ideal posture”) or tilted forward (with an increased lumbar lordotic curve). Introverts, on the other hand, are far more likely to stand with their pelvis tucked under, in either sway back or flat back posture. This research is consistent with Thomas Hanna's observations of the Green Light and Red Light postures. Green Light posture is most common in people with confident personalities, whereas Red Light posture is more commonly seen in shy, withdrawn people.

Research has also found that the muscles of people who have ideal posture are more relaxed, and the muscles of people who have the three non-ideal postures (listed above) are more contracted. Muscular tension translates into emotional tension; people with the three non-ideal postures have more rigid and less adaptable personalities than those who have ideal posture.

The relationship between personality and posture works in the opposite way as well; the way we choose to stand affects how we feel inside. Amy Cuddy of Harvard University and Dana Carney and Andy Yap of Columbia University examined the effects of what they call “power posing.” In the study, test subjects spent two minutes in either a high-power pose (like that of Green Light/action response) or a low-power pose (like that of Red Light/withdrawal response).

People who adopted the high-power poses experienced a spike in testosterone (a hormone associated with assertiveness), a drop in levels of cortisol (associated with stress), an increase in feelings of confidence and power, and increased risk-taking behavior. People in low-power poses experienced opposite results. Incredibly, spending just two minutes in a posture has immediate effects on the way we feel, our behavior, and our hormone levels. Imagine the effects of spending a lifetime in a certain posture.

So, our personalities play a role in the muscular patterns that we develop. On the flip side, our muscular patterns affect the way we feel inside and how we behave, especially once the patterns have become habitual and we are standing and moving in these patterns all the time. Our personality and our learned muscular patterns work in tandem to keep us stuck in habitual ways of standing, moving, feeling and acting. And unfortunately, these patterns lead to increased muscle tension and sometimes pain and actual physical damage to our body.

The Effects of Automatic Imitation

Mirror neurons, found in parts of the brain responsible for movement, vision and memory, are activated equally when we perform an action and when we observe another person performing an action. Like pretty much everything that happens automatically in our nervous system, the way these neurons function help us to survive. Automatically imitating other people's postures and movements helps to establish a sense of affinity and facilitate communication, both of which are vital elements in forming relationships and creating a healthy group dynamic.

We tend to subconsciously imitate the people with whom we spend a great deal of time and have a desire to create rapport. As we initially develop motor patterns during childhood, we subconsciously imitate our family members' posture and movement. So if you think you get your posture from your mother, you could be right – but genetics doesn't have much to do with it.

As we grow up, our friends and our significant others tend to override our family members as being the most influential subjects of our automatic imitation. Mirror neurons fire when we merely observe someone we want to connect with, so simply spending time with your friends or significant other can lead to changes in your posture and movement. Beware if you are spending a lot of time with someone who has poor posture or dysfunctional movement patterns, as you can easily mimic their posture and movement without even realizing it.

The Effects of Athletic Training

During a game, competition or performance, there is little time for conscious decision-making; every reaction must happen both instantaneously and accurately. This is why athletes practice so much. It's not just about being in the best possible physical condition. It's about training the entire neuromuscular system to be able to react automatically and with precision while under stress.

Athletes spend so much time consciously training themselves with the goal of acquiring muscle memory that their motor patterns tend to be very deeply learned. And depending on what sport or discipline they practice, they may have to train themselves to move in unnatural ways. Athletes' movement patterns are also shaped by all the same factors as non-athletes: stress, personality, their individual daily activities, handedness, and automatic imitation. When combined with the training required by their chosen sport, the result is that their patterns can be more complex than non-athletes.

Sometimes athletic training will improve an individual's posture and movement, helping to correct imbalances and increase overall strength and flexibility. But in many cases, the great number of repetitions or the strain of heavy weight required by athletic training can enhance existing dysfunctional patterns. For example, a non-runner whose hips are internally rotated, creating a knock-kneed stance, may have no pain at all until she starts to train for a marathon. Her movement patterns are then put to the test, and she quickly develops pain in her hips, knees and ankles. Likewise, a man who habitually stands with an arched lower back may have no issues until he decides to get in shape and start weight-lifting. His back muscles become tighter with each repetition; soon his lower back aches constantly and the compression of his lumbar spine leads to bulging discs.

Some types of athletic training magnify our natural function of handedness, demanding a great deal from our dominant side. Many sports require throwing, hitting or kicking a ball with great force and precision, over and over again. Other disciplines, such as gymnastics and dance, require jumping, balancing and turning movements to be performed repeatedly on one side, shifting the body weight and creating imbalances in posture and strength. The sheer overuse of one side of the body is likely to lead to dysfunctional movement patterns, as well as fatigue and structural breakdown.

While the intensity of athletic training poses risks for recurring injuries and joint degeneration, the pros generally outweigh the cons. In addition to the endless physical and mental benefits that come from regular exercise, studies show that serious athletic training teaches discipline, increases life satisfaction, and improves sense of well-being. Athletes and coaches simply need to have a stronger focus on training proper movement patterns and put a higher value on injury prevention and recovery. As the saying goes, train smarter, not harder.