The Infant and Lifelong Patterns

Watch an infant learning to walk up stairs and you’ll notice her preference to begin each step with a certain foot. Even before entering the world, she was developing movement predilections. Before she knows it, a first-time gesture will become a full-on action that will evolve into a habit and then a highly orchestrated movement pattern entrenched in her central nervous system.

While there might be times later in life when she’d like to change some of those patterns (reprogramming certain ones might require months of persistent attention), without them she couldn’t so much as toddle. So what is the mechanism behind this indispensable process of movement pattern development?

A metaphor might serve best: A neuromotor command is a stream running down a hillside—the more water that flows, the smoother and deeper the path and the stronger the current. Likewise, synaptic pathways are strengthened through use by the proliferation of myelin coating around the involved axons, which speeds the conduction velocity of electricity through these routes. The more the neuromuscular pathway is activated, the more extensive the myelination; this relationship engenders a positive feedback loop in your nervous system.

Furthermore, not only does the proliferation of myelin “steepen the stream,” but repeated activation of a synaptic pathway actually induces molecular changes that anchor those connections in place—like coating a desired waterway with cement in order to make its route of flow more permanent. Just as water preferentially flows within a well-worn path, your neuromuscular system accumulates patterns similarly—and these will be reflected in your external motions. (This is known as the Law of Facilitation.)

Back to the infant: little does she know, but the habits she’s instilling in her body now are setting the stage for the movement characteristics she will embody for the rest of her life.

Fun in a Doorway

Need a break from your studies and want to experience Golgi tendon organs firsthand? Stand in a doorway with your arms by your sides. Then, press the backs of your hands into the doorjamb on either side. Continue with this resisted shoulder abduction for a good thirty seconds, even a minute. Then step forward and let your arms rest. Your arms should feel very light and naturally “float out” into abduction, replicating the motion you were attempting in the doorway (left).

Why does this occur? In a sense, you were fooling your tendon organs (and CNS) into believing that this steady, isometric contraction represented the new resting muscle tone of your deltoids. Specifically, your tendon organs were put under tension from the pull of the muscle fibers. The CNS determined that this increase in tension wasn’t a threat, but it did seem persistent enough that it should recalibrate (and, in this case, increase) the amount of muscle tone in your deltoids when they are at rest.

At the same time, the CNS is sending inhibitory (relaxing) messages to the latissimus dorsi and pectoralis major muscles (the antagonists), telling them to relax. Thus, when you walk out of the doorframe, your deltoids adjust to fit their newly recalibrated tone. As they shorten to the new length, they meet no antagonistic resistance, since those muscles have been told to “chill out” proportionately.