

Minding the Movement of the Body

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Working by day as a medical researcher at Harvard medical school objectively studying the science of tai chi and at night as a community-based Tai Chi instructor, for many years I have walked to the metaphorical S-shaped line dividing the more rational and intuitive halves of the Tai Chi Yin and Yang symbol. Both as a scientist and teacher/practitioner, I have explored how best to bridge the wisdom underlying my two vocations, or how the yin and yang can inform one other.

One area I explore in The Harvard Medical School Guide to Tai Chi with writer Mark L. Fuerst is the practical application of intention, or Yi, which distinguishes Tai Chi from other exercises. Here's an excerpt from the book about that concept.

Minding the movement of the body

Movement and self-defense were the driving forces in the evolution of animal brains, so thinking about the brain in the context of Tai Chi makes sense since it is a martial art. Movement is a key feature of Tai Chi, which, legend has it, was based on the movement of animals in battle. This is not solely a physical phenomenon but reflects the connection of the body and the mind. In the early stages of Tai Chi training, the mind is often occupied with learning gross motor sequences and movement patterns, which can be helpful for memory. However, after you learn the gross movement patterns and become comfortable with them, the "thinking" mind begins to relax during practice and shifts more to observing the body in motion. As you progress further in Tai Chi, your mind begins to feel at home in your body as you move from position to position. Over time, you can begin to add intention through imagery. This enhances the quality and characteristics of the movements.

At even higher levels of practice, movement and thought become one; there is no lag time

between an intention to move, act, or react. You don't "try" to move a certain way, you just do the movement. There is no distinction between consciously "thinking" about the movement and the body physically fulfilling the request. Master Wang Xiang Zhai, founder of Yi Chuan, another internal martial art, said, "in a fight, if you have to think and then respond, you are too late."

If you play sports, you may have felt this hyper-merged mind-body state, often described as "being in the zone." I recall an interview with legendary Dallas Cowboys running back, Hall of Famer Emmitt Smith who talked about those unique moments where time seemed to slow down. He could see plays unfold in ultra-slow motion, which gave him time to choose the best direction to run the ball. Others have described similar mind-body states during meaningful religious or artistic experiences. For most athletes, these moments are atypical, occasional, and fleeting. In contrast, those who have attained higher levels of Tai Chi and related mind-body training can apparently shift into the states of "being in the zone" at will, and sustain them for significant periods of time. You might say that they can dissolve the hyphen in the phrase "mind-body."

One practical expression of the merging of mind and body in Tai Chi is the quality of strength or force used in movements, especially when doing interactive Tai Chi with a partner. Tai Chi classic and contemporary texts make a key distinction between strength that is primarily directed by physical force, referred to as Li, and an internal strength that reflects a more conscious movement, referred to as Jin. Robert Chuckrow, a physics professor and high-level Tai Chi teacher and scholar, translated Li as ordinary strength and Jin as "educated" strength. He speculates that the use of intention in mindfulness and movement

may generate low-level nerve impulses to muscles and surrounding tissues. These impulses are below the threshold of generating observable movement, but may add an energetic quality or liveliness – an intrinsic energy – to Tai Chi movements. This liveliness may also prime your body so that you are more prepared to respond, if need be (for example, react to an attack), in a more efficient, coordinated manner. This model of a highly sensitized neuromuscular system can explain how your body becomes attuned to react quickly.

Motor Imagery

A fascinating branch of Western mind-body research adds support to the impact of intention on movement and neuromuscular physiology. Many studies show that simply imagining a movement can improve the actual performance of that movement. This research also suggests that mental training, even without physical training, can change brain structure and function, similar to physical training. Motor imagery, as this is called, is commonly defined as the cognitive process in which motor acts are mentally rehearsed without any overt body movements. Motor imagery has been widely used as a tool for improving sports performance and is increasingly being explored as a promising tool for rehabilitation of neuromuscular conditions, such as stroke and Parkinson's disease.

One study conducted by researchers at the Cleveland Clinic Foundation demonstrated that healthy young adults who mentally practiced simple muscle movements could increase strength and change brain activity. One group in this trial practiced only mental exercises to increase pinky strength. This group was asked to think as strongly as they could about moving the pinky sideways without actually moving the finger. A second group practiced actual physical finger exercises, and a third (control) group did no mental or physical exercises. The mental and physical exercise groups practiced for 12 weeks, five minutes a day, five days a week. Compared to the control group, the mental exercise group increased their pinky muscle strength by 35% and those doing the actual physical exercises increase their pinky strength by 53%. What's more, the improvement in muscle strength for the motor imagery group was accompanied by significant increases in a measure of the brain's ability to control voluntary muscle contractions.

In other studies, as Chuckrow speculated, motor imagery or intention resulted in measurable

changes in muscle activation. For example, in one study participants imagined lifting heavy weights, which enervated electrical activity in their bicep muscles. Many other motor imagery studies report improved physical performance of a task and measurable changes in the brain, however, they have not observed changes in muscles. This has led some researchers to hypothesize that the impact of motor training is primarily in the brain, and the peripheral

nervous system is relatively silent. It may be that the lack of electrical response in muscle is too low to be detected by instruments. Nevertheless, just the idea that mindful movement can improve motor function and learning is quite remarkable.

How is this relevant to Tai Chi? The majority of studies to date suggest that the best way to learn a new physical movement is to combine motor imagery with actual practice of the movement, which works better than either motor imagery or physical practice alone. This suggests that Tai Chi may be an excellent choice to rehabilitate and manage neuromuscular diseases, such as stroke-related paralysis, Parkinson's disease, and multiple sclerosis, and may explain why Tai Chi shows promise in preliminary evaluations of these conditions.

