

Failed Motor Programming and the Lumbar Multifidus in Locomotor System Dysfunction

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*"When injured, most tissues heal, but skeletal muscles learn."
- Janet Travell, MD*

It is well-accepted in chiropractic that the nervous system plays a critical role in locomotor system function. In the last few years, that role has become increasingly more defined. A popular theory contends that after an injury to the low back, regardless of what treatment is applied, the patient will improve; however, mounting evidence directly refutes this claim.^{4,8,2,3} It appears that after an injury, although symptoms usually disappear, a new motor programming strategy is adopted.⁴ The brain appears to lose the ability to differentiate between high and low-loading strategies.¹

If a patient bends over to pick up a pencil, he or she should not require as much muscle recruitment as when lifting a heavy box; however, the patient still needs coordinated, sequential muscle function. After an injury, there is excessive recruitment of the large, strong, global muscular system. There also appears to be a mistake in the "feed-forward" mechanism. For example, an instant before a person moves or lifts an extremity, his or her motor system recruits the lumbar multifidus and the transverses abdominus, providing a stable spine for all the global, long lever muscles to work off of and use as a base. After an injury, this stability is altered - an easy explanation for the high rates of reoccurrence in low back pain after initial injury.

Manipulation appears to play a dramatic role in helping restore these neurological interworkings to normal.⁹ An ideal time to implement low-tech exercises to increase multifidus recruitment is immediately following manipulation. The multifidus muscle was previously thought to be an extensor or a posterior rotator, due to fiber orientation. We are now convinced its role is mostly proprioceptive in nature.⁸ It has other roles, including its key anatomical attachment to the joint capsule, allowing it to pull the capsule out of the way to avoid meniscoid extrapment.⁸ This further illustrates that the timing of multifidus contraction is critical.

Indirectly, the multifidus can contribute to sacroiliac joint stability by its swelling action during contraction, creating increased tension in the thoracolumbar fascia.⁴ The multifidus also can become dysfunctional in the absence of trauma. It has been shown that multifidus activity decreases with poor posture.⁷ If the multifidus is dysfunctional for a length of time, it will begin to shrink and undergo composition changes, becoming infiltrated with fatty tissue.³ These changes can be viewed on CT scan or MRI;³ however, most radiologists have not been exposed to this information, so you will need to ask them to comment on it. These changes have been shown to be reversible with proper stability training.³

There are ways to suspect multifidus dysfunction without the use of advanced imaging. With the

altered motor programming strategy we mentioned earlier, the patient will most likely begin to excessively recruit his or her superficial erector spinae muscles; this is easily viewed and/or palpated in the thoracolumbar area. However, the erector spinae are long-lever muscles; with the exception of a load in flexion,⁵ they are poorly suited for segmental stability. Additionally (and ironically), they create thoracolumbar flexion,³ which further shuts off the lumbar multifidus.

In terms of patient care, addressing the multifidus with your acute and chronic lower back pain patients will significantly increase your results. This also is important information from a reimbursement standpoint, as managed care organizations are reluctant to pay for rehabilitation. Further, this is good information to pass on to your potential local referral network of family practitioners, orthopedists, neurologists, etc., so they don't hesitate to refer to your clinic, even when dealing with "first-episode" lower back pain patients.

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