

# Essentials of Dynamic Stability Training and Chiropractic Care

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In recent literature and current guidelines, there is a focus on improving motor control as an important component of rehabilitation for both low back and neck problems, especially for chronic or recurrent conditions. Many recent studies include in the major goals of rehabilitation enhanced neuromotor control of the core-stabilizing musculature in order to improve stability under dynamic conditions.<sup>1</sup>

In the course of activities of daily living, recreation and sports, we are exposed to unexpected stresses and strains, shifts of load or perturbations that can, if not well-controlled, result in poor performance and/or injury. The exercise training programs designed to develop this type of motor control are included under the heading of dynamic stability training. The concept of dynamic stability has evolved over the past decade, since findings from accumulated research point to stability disturbances as contributing to the natural history of both back and neck problems.

Results from numerous research papers conclude that both back and neck problems are intermittent and recurrent processes that erupt periodically over the course of a lifetime.<sup>2-4</sup> Studies report that patients with back and neck problems use very different muscle-activation patterns and impose altered loads on the spine, resulting in disturbed kinematics, altered patterns of muscle contraction, and abnormal stresses and strains on passive tissues.<sup>5,6</sup>

Pain can induce a major reorganization of motor control, increase the risk of injury, change patterns of muscle activity, as well as reduce strength and endurance.<sup>7,8</sup> In addition, longitudinal studies have found that both lumbar and cervical pain can induce a major reorganization of motor control which can persist despite patients reporting recovery, and may be a factor involved in high rates of recurrence<sup>9</sup>

We have come to realize that the experience of pain is only one component of a more complex disturbance in these patients. Disorders of neuromuscular control, changed co-activation patterns, recruitment and muscle-firing sequencing are pivotal in the development of intermittent exacerbations and remissions which appear to be the natural history of these problems, resulting in an increased vulnerability to re-injury and tissue damage.<sup>10</sup>

A 2008 paper concludes that injury and pain may lead to motor-control changes which perpetuate problems and lead to chronic or recurring pain and stiffness by inducing changes throughout the entire core of the sensorimotor brain.<sup>11</sup> Descarreaux recently concluded that impairments of sensorimotor control seem to be an integral part of chronic low back pain. This has been documented in terms of objective measures such as

reduced repositioning accuracy, changes in postural control, delayed muscle responses to sudden trunk loading, increased trunk-movement detection threshold, and altered patterns of synergistic muscle activity. All of these may represent motor-control changes that can perpetuate dysfunction and chronic pain.<sup>12</sup>

With a greater understanding of these neuromotor changes comes a new approach to manage and improve the natural history described above. Dynamic stability training offers both evidence of effectiveness and hope for people with recurrent or chronic back problems. The fundamentals underlying such training are based on the classic principles of exercise training: specificity, recruitment, progressive overload, reversibility, etc.<sup>13</sup>

A major goal of this type of instruction is to recruit muscles involved in dynamic trunk stability and the entire kinetic chain to work together as parts of larger functional units, to maintain stability and control motion throughout a full range of body movements. Barr describes the concept of stability as both a static and dynamic process, including static position, controlled movement, alignment in sustained postures and movement patterns that reduce tissue strain, avoid trauma and allow efficient muscle action.<sup>14</sup>

To incorporate dynamic stability training into a rehabilitation program, the plan may include utilization of either unstable (gym ball, wobble board, balance pad, etc.) or soft (balance pad) training surfaces because such foundations increase the activation of core stabilizing muscles, as well as stimulate proprioception.<sup>15</sup> Performing exercises on unstable equipment significantly improves balance and postural control.<sup>16</sup> Results of studies demonstrate that the use of unstable or soft platforms can markedly increase mechanoreceptive activity and facilitate spinal motor and brain-stem motor reflexes involved in regional and postural stability.<sup>17</sup>

Joint proprioception is critically important in enhancing the rehab process. Muscles need both motor stimulation and the stimulation supplied from joint receptors. However, recent articles report that receptor/transducer signals are corrupted, leading to a “false kinesthetic perception” with subfailure injury, overstretching and creep deformation of ligaments.<sup>18,19</sup> Furthermore, working out in a proprioceptively starved environment, which occurs while training on exercise machines that provide support and stability, and reduce the demand on the neuromotor control system, does not challenge, stimulate and train the motor-control system to provide multi-joint

exercises are performed can transform them into a core-stability program. Performing exercises on an unstable or soft surface; while standing, rather than sitting; using free weights, rather than machines; and training unilaterally with dumbbells, rather than barbells, stimulates the entire kinetic chain, facilitates proprioception and optimizes force transfer and load control throughout the entire body linkage.<sup>21</sup>

The effectiveness of a core-stabilizing training program may be further enhanced with the addition of chiropractic manipulation. Manipulation has been documented to markedly stimulate the somatosensory system, enhancing mechanoreception by exciting both muscle spindles and golgi tendon organs.<sup>22,23</sup> The response appears to be a direct reaction to the high-velocity thrust. The faster the thrust is delivered, the higher the frequency of discharge of muscle spindles.<sup>24</sup> This may help normalize proprioception, recruit receptors to discharge and prevent receptors from atrophying. Such changes in proprioceptive output from dysfunctional joints may reset and normalize corrupted motor programs to improve dynamic stability.

Moreover, the high-velocity, low-amplitude manipulative thrust may restore motion by gapping restricted joints and breaking the bridging of microscopic fibers that make up intra-articular adhesions.<sup>25</sup> By increasing joint range of motion, overcoming abnormal restrictive barriers, stimulating mechanoreceptors and resetting

motor programs, the benefits of manipulation may improve the body's response to exercise, enhancing outcomes and reducing injury risks.<sup>26,27</sup>

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