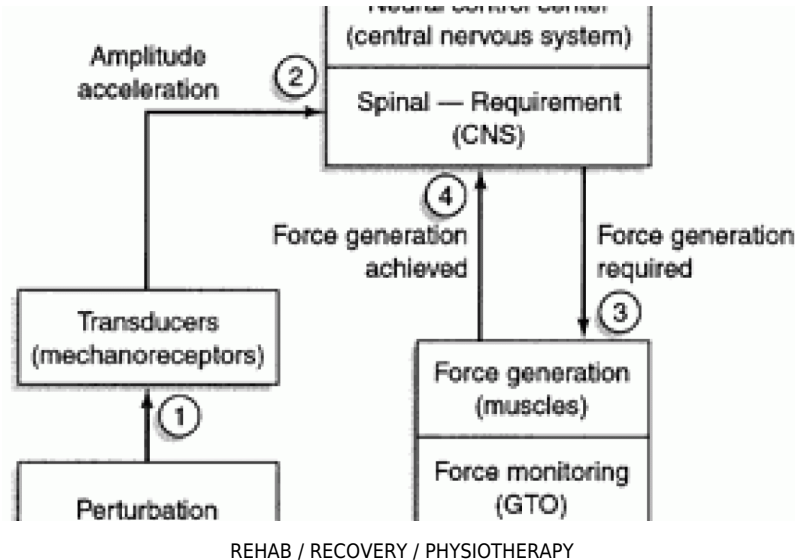


Dynamic Chiropractic



Rehabilitation for Cervical Stability

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Editor's Note: Dr. Murphy is a guest columnist this issue for Dr. Craig Liebenson's "Rehabilitation" column. The archives for Dr. Liebenson's column are on line at <http://www.chiroweb.com/columnist/liebenson>.

Cervical stabilization training is a method of exercise that, like its counterpart in the lumbar spine, is designed to improve the inborn mechanisms by which the cervical spine maintains a stable, injury-free state.¹ This is accomplished through a series of exercises that are relatively simple from the standpoint of time and equipment, but are physiologically complex. To understand cervical stabilization, a brief review of the mechanisms by which the cervical spine maintains stability is in order.

The concept of spinal stability, as has been discussed previously in Dr. Liebenson's column, has changed dramatically in recent years, sparked primarily by an important paper by Panjabi,² which described what I like to refer to as dynamic stability. Dynamic stability responses are those that occur as a result of perturbations: forces introduced to the cervical spine that have the potential to cause injury. This is distinguished from passive stability, by which the spine maintains stability via passive tissues such as ligaments, discs, bones and joint capsules.

When a sudden perturbation is introduced, the nervous system must detect its presence, determine the specific locations, magnitude and direction of muscular response that is required, see that that response is carried out, and monitor the result (see Figure 1). If any aspect of this feedback loop is dysfunctional, injury may result. This mechanism represents the general method by which dynamic stability of the entire spine is maintained. Thus, when it comes to training, there are some similarities between training the lumbar spine and pelvis for stability and training the cervical spine. Proper stability mechanisms of the cervical spine are dependant on a normally functioning lumbar spine and

pelvic stability system and vice versa, but there are unique characteristics of the cervical spine that require us to make modifications in our approach to training for stability in this area.

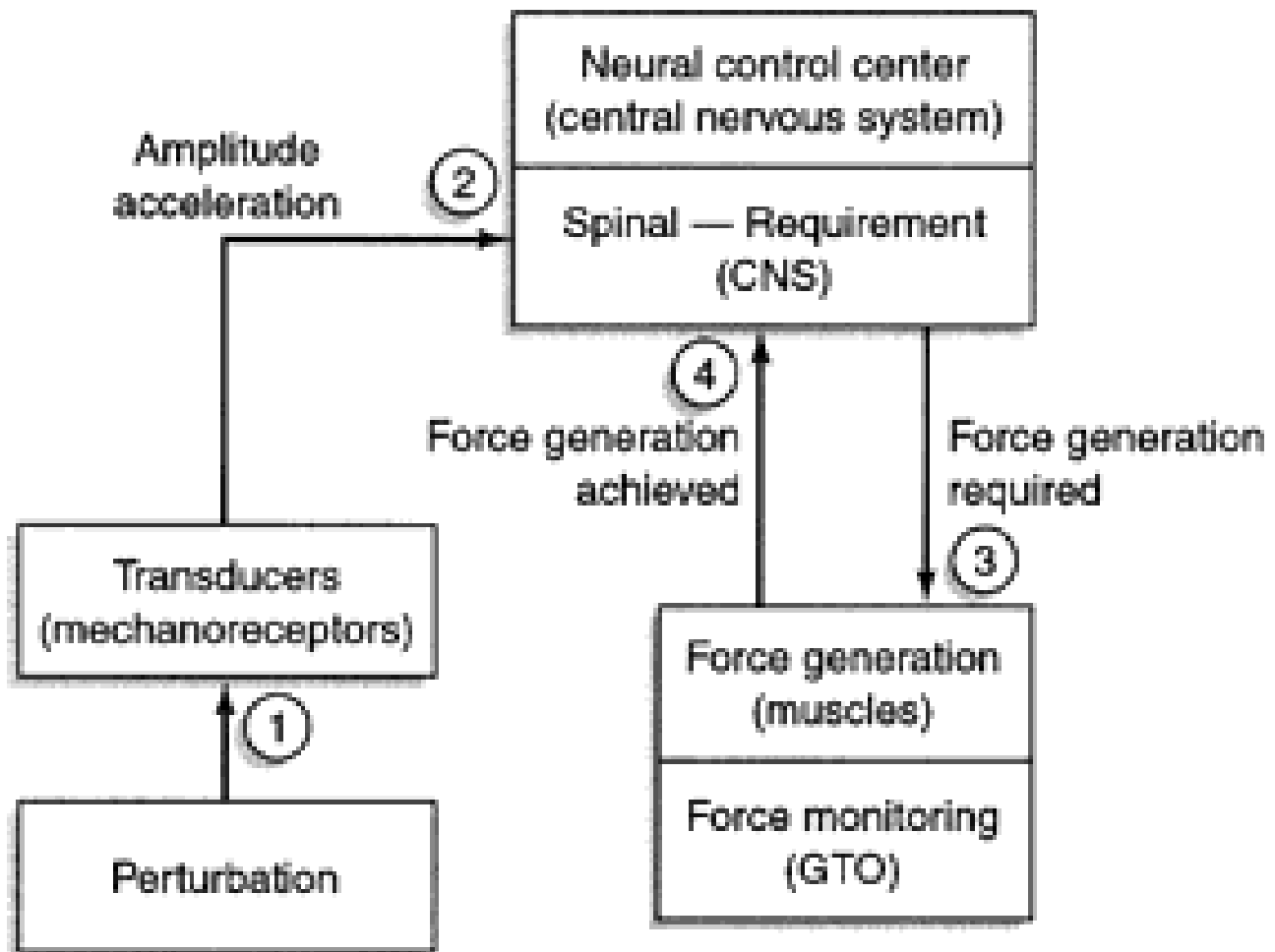


Figure 1: The mechanism of dynamic stability. Reprinted with permission from Murphy DR (ed.) *Conservative Management of Cervical Spine Syndromes*. New York: McGraw-Hill, 1999.

Unlike the lumbar spine, the cervical spine is a structure that has the burden of carrying the head around. It must maintain not only intersegmental stability but also stability of the head. The purpose of head stability is both to prevent the head from flopping around during body movements and to maintain the sense organs in a stable position for optimum function.

To accomplish this, there must be a stable relationship between the neck and thoracic spine and between the neck and the head. The most important muscles responsible for maintaining these relationships are the posterior intersegmental muscles,³ (multifidi and suboccipitals); the deep cervical flexors,⁴ (longus capitis and colli); and the lower cervical/upper thoracic extensors⁵ (semispinalis cervicis and longissimus cervicis). The stability of the cervical spine is also greatly dependant on the stability of the scapula and upper extremities. The most important muscles in scapular stability are the middle and lower trapezius and the serratus anterior.⁶ Therefore, in stabilization training, these are the muscles that must receive the greatest focus.

There is another aspect of cervical stability that differentiates it from that of the lumbar spine: the importance of eye-head-neck coordination. This coordination is primarily brought about by reflexes, specifically the cervico-ocular reflex, vestibulo-ocular reflex, cervicocollic reflex, vestibulocollic reflex, optokinetic reflex, smooth pursuit and saccades.⁷ In addition, as was stated earlier, good lumbar stability is essential for good cervical stability, as are proper stability mechanisms of the foot.

The need for effective use of time calls for training only those aspects of cervical stability that are specifically dysfunctional. This is determined by a series of clinical tests that are designed to assess each mechanism that can impact cervical stability. These are listed in Table 1. Once specific dysfunctions are identified, training can be targeted to the patient's particular problem. The exercises themselves are designed to minimize the need for time-intensive involvement on the part of the doctor, and rapid transition to home care. This makes rehabilitation more time and cost-effective for all concerned.

Table 1. Functional tests for assessing those processes that impact cervical stability.

Test	Assesses
Cervical stability test	Cervical stability
Shoulder abduction movement pattern test	Scapular stability
Pushup test	Scapular stability
Revel's test	Eye-head-neck coordination
Hip extension test	Lumbar stability, cervical extensor/ upper trapezius hyperactivity
Stepping test	Tonic neck reflex, afferent processing
Postural foot reaction test	Foot stability

Table 1. Functional tests for assessing those processes that impact cervical stability.

Floor exercises can be used to enhance cervical and scapular stability. The basic starting point is training the patient to perform a cervical brace (see Figure 2). The patient co-contracts the deep cervical flexors and lower cervical/upper thoracic extensors. Mastery of this co-contraction maneuver is essential for the success of the training. Patients are then instructed in a series of limb movements that they carry out while maintaining the cervical brace position (see Figure 3).



Figure 2: Cervical brace in the quadruped position. Reprinted with permission from Murphy DR (ed.) *Conservative Management of Cervical Spine Syndromes*. New York: McGraw-Hill, 1999.



Figure 3: Arm movements while holding the cervical brace. Reprinted with permission from Murphy DR (ed.) *Conservative Management of Cervical Spine Syndromes*. New York: McGraw-Hill, 1999.

The limb movements are designed to further challenge the stabilizing muscles by forcing them to stabilize against a load; secondly, they are designed to engage the cerebral cortex so that the co-contraction of the deep cervical flexors and lower cervical/upper thoracic extensors can be driven into the subcortical aspect of the central nervous system. If necessary, the patient can be transitioned to the Swiss gym ball, which provides an unstable surface upon which to train.

Eye-head-neck coordination can be trained using sensorimotor exercises on a wobble board. With this procedure, the patient stands on a wobble board while the doctor brings them through several movements designed to facilitate eye-head-neck reflexes (see Figure 4). Cervico-ocular, vestibuloocular, smooth pursuit and saccade movements are facilitated individually while the patient maintains stability on the wobble board.



Figure 4: Facilitation of oculomotor reflexes while balancing on a wobble board. Reprinted with permission from Murphy DR (ed.) *Conservative Management of Cervical Spine Syndromes*. New York: McGraw-Hill, 1999.

The essence of rehabilitation, regardless of what part of the body is the primary focus, is the improvement of function. Understanding the function of the cervical spine and all related functions that impact the cervical spine is of paramount importance in designing a rehabilitation strategy for each individual patient. This allows for smooth transition from more passive forms of care to more active forms, in addition to maximizing those inborn capacities that the locomotor system has to protect itself from injury.

References

1. Murphy DR. Sensorimotor training and cervical stabilization. In: Murphy DR (ed.) *Conservative Management of Cervical Spine Syndromes*. New York: McGraw-Hill, 1999:607-640.
2. Panjabi MM. The stabilizing system of the spine. Part I. Function, dysfunction, adaptation and enhancement. *J Spinal Disorders* 1992;5(4):383-389.
3. Solomonow M, Zhou BH, Harris M, et al. The ligamentomuscular stabilizing system of the spine. *Spine* 1998;23(23):2552-2562.
4. Janda V. Muscles and motor control in cervicogenic disorders: assessment and management. In: Grant R.(ed.) *Physical Therapy of the Cervical and Thoracic Spine*. New York: Churchill Livingstone, 1994:195-216.
5. Moroney SP, Schultz AB, Miller JAA. Analysis and measurement of neck loads. *J Orthop Res* 1988;6:713-720.
6. Langley P. Scapular instability associated with brachial plexus irritation: a proposed causative relationship with treatment implications. *J Hand Ther* 1997;10:35-40.
7. Murphy DR. Normal function of the cervical spine II: neurophysiology and stability. In: Murphy DR (ed.) *Conservative Management of Cervical Spine Syndromes*. New York: McGraw-Hill, 1999:45-70.

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