

Proprioception and Effective Rehab Care

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Proprioception is an appreciation of position, balance, and changes in equilibrium on the part of the musculoskeletal system. The human body is equipped with several independent yet interrelated mechanisms to sense and provide this important information. Specialized nerve endings present in the soft tissues of the musculoskeletal system interact with the central nervous system to coordinate body movements, postural alignment and balance.

Sensory Information Highway

Some proprioceptive sensory organs are located in muscles and tendons, while others are within the connective tissues of joints. There is a constant flow of information regarding the status and function of the musculoskeletal system from these structures to the spinal cord, the cerebellum and the brain. If any of these sensors begins to transmit false or incorrect information, there is a decrease in movement efficiency, which can have a damaging effect on joints and muscles. There is the potential for postural coordination problems that can range from just annoying to painful or even hazardous to health.

Data Transmission Errors

Chronic postural problems. Position receptors in the feet, spine and especially in the neck (head-righting reflexes) must coordinate smoothly in order to maintain postural equilibrium. Difficulty in achieving or keeping optimal postural alignment, or problems with excessive postural sway, frequently are caused by inaccurate information sent by spindle sensors in chronically strained muscles or by joint mechanoreceptors.

Post-whiplash headaches and vertigo. More than 20 years ago, researchers demonstrated the involvement of spinal (especially upper cervical) proprioceptors in the various symptom patterns found in post-whiplash patients.¹ Complaints associated with problems involving position sensors include: tension headaches, disequilibrium and vertigo, and persisting muscle tension and myofascial pain.² It is apparent that treatment methods that address the proprioception system must be included for recovery.

Recurrent subluxations. When patient response to standard chiropractic adjustments is incomplete, the status of the proprioceptive system must be considered. If inappropriate information is supplied by position receptors, the body's movement habits, muscle tension factors and pain patterns may remain unchanged. A 1997 study demonstrated a correlation between chronic neck pain, more frequent subluxations, and standing balance.³ This study also suggested the involved musculature was undergoing atrophy and fatty degeneration.

Chronic pain syndromes. Another 1997 study of patients with chronic neck pain found most had significant, unrecognized problems in the function of their proprioceptive systems.⁴ Many patients with chronic myofascial complaints can be shown to have inappropriate stimulation arising in the joints or muscles in the region.⁵

Athletic performance. Performance in sports is directly determined by the status and coordination of the proprioception system. Injury prevention, return-to-activity rehabilitation, and even winning depend to a great deal on how smoothly and quickly the musculoskeletal system can respond to position, speed, and balance changes. Many of the currently popular approaches to improving sports performance (such as plyometrics) are based on training and developing proprioceptive responses.⁶

Getting Back on the Fast Track

Many of the more recent (and some very traditional) treatment approaches to musculoskeletal problems take advantage of proprioceptive concepts. It has been shown that joint manipulation, especially of the spinal joints, has a direct and immediate effect in normalizing receptor responses. This had been hypothesized for several years, based on clinical responses and neurological studies in animals.⁷ A small study in humans found that specific spinal manipulation was much more effective than a series of stretching exercises in improving the proprioceptive repositioning of the head in patients with chronic neck pain and positioning problems.⁴ Another study found that specific spinal manipulation effectively treated a series of patients who demonstrated cervicogenic vertigo (90 percent became symptom-free).⁸

Certain soft-tissue techniques, such as kinesiological and myofascial approaches, have been found to be effective in normalizing the balancing capabilities of the position receptors. Trigger-point therapy (using ischemic compression, spray and stretch, or injections) seems to be able to correct imbalances in muscle tone and tension that are perpetuated by sensory receptor problems.⁹

The more effective stretching maneuvers take advantage of our recent knowledge of the proprioceptive responses in the muscles and joints. A list of some of the more popular procedures includes: active release (Leahy technique), contract-relax (CRAC), muscle energy techniques, postisometric relaxation (Lewitt technique), and proprioceptive neuromuscular facilitation (PNF). By activating and coordinating the muscle spindles and the mechanoreceptors, these stretching procedures can be very effective in chronic cases.¹⁰

Speeding up the Process

Patients with proprioceptive imbalances often benefit from various external supports to help them achieve proper body positioning. These may include custom-made, flexible orthotics for the foot and ankle, cervical pillows for chronic neck pain, and chair supports to provide alignment of the back during sitting.¹¹

Advances have been made in methods for strengthening postural muscles based on our knowledge of proprioception. Since postural (especially back and neck) muscles are tonic, slow-twitch muscles, we must use slow and controlled exercises in an upright position, in order to stimulate and normalize input from position receptors.

In fact, closed-chain exercising (whether stretching or strengthening) is being used much more frequently in sports and rehabilitation. By keeping the body upright and weight-bearing during exercising, all of the proprioceptors are recruited to condition the muscle and joints. This provides a rapid and appropriate neuromuscular learning experience, and allows the skills practiced to be used in functional everyday and sports-specific situations.

Two areas in which this approach is seen are walking and balance retraining. Walking is a basic,

deeply ingrained motor pattern, sometimes called "cross-crawl." Brisk walking with a good arm swing activates this neurological program, and often can help in normalizing inappropriate receptor input. Even more specialized proprioceptive exercises use gym balls,¹² balance and rocker boards,¹³ and even special "balance shoes."¹⁴

To help re-coordinate and improve the function of the upper cervical proprioceptive system, specific eye-head-neck coordination exercises have been developed.¹⁵ These recognize the complexity of the interconnections between the upper cervical receptors and information from the visual and oculomotor system, and from the vestibular/labyrinthine system.

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