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Nociception, Mechanoreception and Proprioception ... What's the Difference and What Do They Have to Do with Subluxation?

By David Seaman, DC, MS, DABCN

This topic is a fruitful one for regular bloopers from BOOPers and nonBOOPers. A future breed of subluxation-oriented chiropractors, unlike us (their predecessors), will not be confused by these words. A future breed of chiropractors, perhaps the real doctors of the future, might also heed the words that have been attributed to Thomas Edison and "interest his patients in the care of the human frame, in diet, and in the cause and prevention of disease." Such a doctor would probably be a neuromusculoskeletal master, a nutritional biochemist, and public health specialist. No one in our profession can boast competency in all these areas. In fact, I do not know anyone who is a true expert in any one of these areas.

In the past two years, I have yet to meet one DC who truly comprehends the meanings and clinical consequences of nociception, mechanoreception, and proprioception, and probably none of us do. Nonetheless we must develop a working understanding of these different topics so we can better understand the science of chiropractic. The most common misconception that I come across is the idea that nociception and mechanoreception are the two subsets of proprioception. Nothing could be further from the truth.

Nociception is the process by which nociceptive receptors receive tissue damaging stimuli that is then carried into the CNS by nociceptive axons (A-delta and C fibers). Potential outcomes of nociceptive input to the cord include pain, autonomic symptoms, vasoconstriction and muscle spasm. Nociceptive input to the cord appears to be the driving force behind the pathogenesis of subluxation (see Figure A). We must remember that nociception and pain are two completely different animals. However, a devastating consequence of both pain and nociceptive stimulation of the hypothalamus, is the release of cortisol by the adrenal glands. Over time, elevated levels of cortisol will promote glucose intolerance, inhibit collagen formation, increase protein breakdown, inhibit secretory IgA output, and inhibit white blood cell function.

Clearly, the clinical importance of pain and nociception should not be minimized.

Mechanoreception refers to the process by which tissue mechanoreceptors are stimulated by mechanical input such as touch, muscle stretching, and joint motion. A-alpha and A-beta fibers carry mechanoreceptive information into the CNS. Segmental reflex effects of mechanoreceptor input can be excitatory and inhibitory. An important inhibitory effect is the presynaptic and postsynaptic inhibition of the nociceptive pathways. It is thought that the adjustment stimulates joint mechanoreceptors by increasing joint motion. There are also suprasegmental reflex effects of mechanoreceptor stimulation, which are proprioceptive in nature.

Proprioception refers to kinaesthetic awareness. Proprioception occurs as a consequence of the integration of vestibular input, visual input and tissue mechanoreceptor input to the cerebral cortex and cerebellum. It is thought that mechanoreceptor input is of the utmost importance for proprioception. Thus, mechanoreceptors give rise to local segmental reflexes and suprasegmental proprioceptive reflex effects. The word proprioceptor is a misnomer, as no somatosensory receptor functions solely in proprioceptive mechanisms.

Nociception, mechanoreception, and proprioception are all intimately associated with the normal and abnormal function of vertebral joints. In a nutshell, nociception induces subluxation which subsequently reduces mechanoreception and proprioception. The end result is individual-specific conditions and patients that go from doctor to doctor and get no relief until they visit a chiropractor.

The topics of nociception, mechanoreception, and proprioception are not well understood by many BOOPers and nonBOOPers DCs and thus, stand as fertile ground from which impersonal support of chiropractic might begin. It would be much easier to work together on reducing our collective ignorance in our severely deficient areas, rather than trying to defend and prove that a tenth of the truth is the whole truth.

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Editor's note: Dr. Seaman, along with Henry Echiverri, MD, and MPI Dean of Faculty Keith Innes, DC, will present MPI's weeklong seminar March 5-11, 1995 at the Hilton Hawaiian Village on Waikiki. For information/registration, call 1-800-359-2289.

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