

The Role of Afferentation in Function Outside In, Below Up (OIBU)

Craig Morris, DC

Most, if not all, chiropractors are aware of the infamous term "above, down, inside out" (ADIO). It is a term designed to clarify that health or disease is determined internally rather than by external factors; by the body's ability to defend and control itself rather than by offenders as proposed by the germ theory. Furthermore, the nervous system is the conduit for this internal mechanism, originating in the brain and efferently spreading to the periphery.

However, we must not forget the key role of information coming from the periphery, both in quality and quantity, to better appreciate the genesis of function. Because of its direction (peripheral to central), we can say that another key component of health and disease is another "inside job," but is directed from "outside in, below up" or "OIBU." The role of afferentation with regard to the locomotor system and function is the issue of this paper. A few clinical pearls may be derived from this unique perspective.

The Basics

One might say that the primary role of an organism from a scientific perspective is to survive in its environment. This survivalist nature is multifaceted, but absolutely requires the ability to promptly sense changes in the environs to appropriately adapt to such changes. The organism also must concurrently track internal changes to coordinate this adaptive mechanism.

In short, stimulation from the periphery is necessary to provide information to the central nervous system, whether the periphery is inside or outside the body. This basic aspect of neurophysiology, perhaps slightly altered in presentation, forms a cornerstone for the following perspective.

The interaction between the afferent nervous system and the central nervous system is analogous to a computer. The stimulus is provoked at the receptor (chemical, mechanical, etc.) afferents, as with a keyboard (mechanical) or scanner (light). The signals are then transferred via nervous versus electronic impulse. The CNS is only capable of accepting properly coded nervous stimuli, while a computer is only capable of accepting properly coded information (Such as the binary system of 0s and 1s). In either case, the original stimuli, regardless of its original presentation, must be reformatted to be utilized and the nature of those reformatted stimuli determined the ensuing response.

Depending on the peripheral input, the CNS organizes the data and then responds, perhaps by stimulating efferents to adapt to the new environment. We can summarize that for the body to respond centrally (ADIO), it must first receive correct peripheral input (OIBU). As a military headquarters is useless without current reports from the field, ADIO is dependent on OIBU!

Clinical Continuum

Despite our appreciation of the importance of afferentation, we rarely think of the importance of deafferentation with regard to dysfunction. However, it seems logical that altered nervous inflow

should provoke an altered nervous outflow, or efferentation. Conversely, we rarely think of the effect of our care on the restoration or normalization of afferentation. In addition, normalizing afferentation might then reasonably normalize function. For example, Bullock-Saxon and Janda found that the speed of activation of the gluteus medius and minimus was doubled in asymptomatic individuals simply by wearing balance sandals (rigid-soled sandals with a rubber hemisphere on the bottom) for 10 minutes daily.¹ The stimulation of the sensation from the periphery brought about a central change, with a response to the periphery, which improved the coordination, and ergo the function, of the locomotor system!

Some Things to Think about

Based upon this model, what physiologically may occur with manual techniques? Theoretically, it would be reasonable to say that the stimulation from the technique provokes a unique afferent barrage that subsequently and specifically alters the efferentation. After all, a thrust technique appropriately applied to the atlas should stimulate a unique and different quantity and quality of sensory input than an inappropriate technique or maladjustment.

Doesn't a consistent pattern of manually stimulated afferentation and respondent efferentation define a technique? Whether the technique is a manual thrust, an activator thrust, a mobilization, a muscle relaxation or a massage technique, the provider and recipient of the technique both realize the differences between each one and the unique afferent barrage to the CNS and the subsequent efferent response.

Finally, shouldn't we be committed to finding the least intrusive or aggressive entry into the afferent nervous system, as this should be the safest means to alter function? This makes sense to me. I have taught my patients "chiropractic first, drugs second and surgery last" as a logical continuum from the most conservative to least conservative means for recovery of their condition. Furthermore, low-force techniques that provide sufficient afferent inflow and improved efferent responses should be preferable over the riskier, greater force techniques.

Practical issues, such as the time factor of treatments, must also be factored into the low-force approach.

For example, a hot bath, light massage, lying still in a quiet room or various types of music may each reduce tension, despite being different approaches to stimulation of the afferents, including the limbic system. I recall a colleague who practices atlas specific technique who always has his patient lay down and rest in a quiet room following an adjustment. I personally think this a fantastic adjunct to care. It is no less a change in afferentation than would be a hot pack, for example, but rather a different type of stimulation provoked.

Practical Considerations

Because of afferentation, we must remember that adaptive changes occur in the locomotor system with the slightest of stimulation. Changes from posture to gait and from respiration to pulse to vascularity are all affected. We see it in the posture and muscle tone of the person ready to fight (due to mechanical stimuli); in the blushing of the person embarrassed by verbal stimuli; and in the hypertonic musculature of the anxious patient who is about to receive their first chiropractic adjustment.

How does this affect our assessment techniques? Professor Karel Lewit states that inspection of posture and gait should generally precede the hands-on part of the examination.² This is because posture, gait and tone are altered by the afferent stimulation associated with the doctor's

palpation.

Just what is occurring with manipulation that involves afferentation? Could it be that the response from pleasant hands-on care, the focus on relaxation before the thrust, the stimuli of the facets at cavitation, and the force of the thrust lead to a local and centrally mediated response that improves function?

Could it be that the altered function is expressed in a general or global response rather than just a local response? This takes us back to our chiropractic roots. Herzog et al. found consistent electromyographic reflex changes of limb muscles following manipulation.³

To take the matter farther, we must appreciate what effect our demeanor and counsel has on our patient's locomotor response. Are we presenting ourselves and our message in a manner that stimulates normalization of function, whether the change is relaxation, reduction of pain or inspiration to exercise?

Summary

This paper is intended to provoke the reader into appreciating the wisdom of our predecessors, yet to continue to broaden our understanding of what it is we are actually accomplishing. I have hoped to stress the importance of the afferent nervous system within the entire nervous system and the larger locomotor system. It is also a reminder that all that we say and do can affect our patients, either positively or negatively, in ways that we can easily overlook.

Finally, I have tried to expose the concept that the CNS does not necessarily differentiate the means (whether 'straight' or 'mixed') utilized to stimulate afferent input. Whether stimulated by the quiet room, the timely joke, the diathermy machine or the postural advice, each must be neurologically reformatted to be centrally utilized. If this is so, then we who are dedicated to normalizing the CNS in the ADIO concept must question our rationale for dividing ourselves when the nervous system so effectively avoids such differentiation.

References

1. Bullock-Saxton JE, Janda V, Bullock MI: Reflex activation of gluteal muscles in walking. *Spine* 1993;18:704
2. Personal communication.
3. Herzog W, Sheele D, Conway PJ. Electromyographic response of back and limb muscles associated with spinal manipulative therapy. *Spine* 1999 24 (2): 146-52.

MARCH 2000