

The Adaptive Mechanisms Concept provides a unifying paradigm for those professions which principally use manual therapy techniques to activate and to re-calibrate the human capacity for self-correction and healing. These manual therapy professions have historically included Osteopathy, Chiropractic, Massage Therapy, Physical Therapy, and Occupational Therapy.

All of us have experienced injuries or periods of low energy when we have had to shift gears in order to keep pace with our busy lives. We adapt in whatever ways we have to in order to compensate. When clients arrive at our offices they bring with them any number of compensations. They would not have asked for help unless their threshold for being able to adapt to their life's stresses had not been exceeded. If our clients were able to activate and re-calibrate their internal adaptive responses, they already would have.

The Adaptive Mechanisms Concept is a biomechanical extrapolation of Hans Selye's pioneering endocrine research into the body's biochemical response to stress. This paradigm proposes that therapeutic attention to the neuromusculoskeletal mechanisms of Breathing, Walking, and the Flexibility of the Autonomic Nervous System provides manual therapy professions with a common broadly defined goal, to enhance and to restore their clients' adaptation capacity. Attention to these mechanisms is relevant to all stages of healing, including, prevention, acute care, rehabilitation, and chronic conditions.

Disability and disease involve the whole of a client's being and body. Therapeutic attention is most helpful when directed toward mechanisms which support the innate capacity for the person to heal from within. Manual therapy professions seem to be directing their attention away from such a "holistic approach" toward marketing strategies which highlight "pain relief".

Selye has defined stress as "the nonspecific response of the body to any demand made upon it"<sup>1</sup>. Whenever the body is required to adapt, it must re-establish homeostasis. It doesn't matter in physiological terms whether the stressor is pleasant or unpleasant. What counts is the intensity, duration, and frequency of the demand for re-adjustment or adaptation<sup>2</sup>.

The central theme of Selye's research indicates that the body "basically responds in a stereotyped fashion to cope with any type of increased demand upon the human machinery"<sup>3</sup>. Selye described this response as the General Adaptation Syndrome. In countless experiments he found that the body reacted in three consistent ways: 1) by enlarging the adrenal cortex, 2) shrinking the thymus, spleen, lymph nodes, and all other lymphatic structures, and 3) by developing gastrointestinal ulcers. He further postulated and determined through his experiments that these reactions evolved through the Alarm Stage, the Resistance Stage, and the Exhaustion Stage.

Selye proposed that "an essential feature of the adaptation process is the confinement of stress to the smallest area capable of meeting the requirements of a situation"<sup>1</sup>. In the Alarm Stage the body's defenses are put on general alert. During the Resistance Stage the body attempts to concentrate its efforts at the site of demand. This localized effort continues until either homeostasis is achieved or the resources of that area are exhausted. Once local exhaustion occurs the body draws on the resources of the neighboring tissues or organs, initiating another cycle of the three stages of the General Adaptation Syndrome. Over time, such repetitive and expansive recruitment adds to the speed of the aging process and pushes an individual closer

to their genetic threshold where symptoms, pain, disability, and illness become chronic conditions.

Selye offers us a picture of how problems in the body spread out to include larger areas and how the pain symptoms your client presents to you may be a distant echo from the source of the real problem.

Selye suggests that the adaptation process typically consists of a balanced blend of defense and submission. Sometimes the body's responses are too weak, so that they do not offer adequate protection while at other times the responses are too strong so that we actually hurt ourselves by our excessive reactions to stressors. Selye notes that our adaptive mechanisms sometimes "get stuck in a groove" and need another stressor to re-calibrate the system.

In neurologic terms Selye is describing the processes of habituation and sensitization, which is also called facilitation<sup>4</sup>. Habituation is the process whereby the signal of a neurological stimulus is progressively muted until it is completely ignored. Sensitization or facilitation is the process whereby even a faint afferent stimulus may produce a strong irritable or defensive reaction.

An analogy might be a person's reaction to sound. When habituated, other people may have to scream at the top of their lungs in order to be heard, whereas, when sensitized, even the softest sound makes one jump out of their skin. This reminds us of how we humans often deal with pain, doing our best to ignore it until it reaches a threshold of intensity which we can no longer tolerate.

Pain is the inner voice of the body crying out for assistance. Pain is the indicator light of our neurological circuits, letting us know something is in trouble. However, the location of pain is not a reliable guide to where the real problem is located. This is especially true for chronic symptom profiles which by their very nature infer multiple cycles of the General Adaptation Syndrome. Such conditions are not simply resolved. They require a broader context of therapeutic attention.

The Adaptive Mechanisms Concept serves to outline the parameters for restoring adaptive capacity. This Concept does not promote any singular technique orientation for accomplishing the goal of restoring adaptive capacity. Rather, it identifies three neuromusculoskeletal mechanisms as crucial elements in the healing process. The importance of respiratory excursion and walking mechanics and of coordinated function within the Autonomic Nervous System has been implied in the manual therapy literature for many years. It was simply waiting to be stated clearly. Central to most forms of manual therapy is the notion that "proper physiology requires proper motion." This is sometimes stated as "structure determines function". Another central tenet is "that proper energetic flow is crucial to the health of the organism". Let us consider the proposed mechanisms beginning with the importance of enhancing the Flexibility within the Autonomic Nervous System.

### The Flexibility of the Autonomic Nervous System

Restoring flexibility within the Autonomic Nervous System (ANS) is a primary goal of any sound treatment strategy. Such flexibility is characterized by a balance between expending energy

reserves, rebuilding these reserves, and the timely elimination of the waste products produced by such activities. In short, a balanced work and rest cycle.

Stress creates the perceived need for a continuous work cycle in the body. It perpetuates an anxious state of readiness, for fight or flight. A good deal of what plagues our clients is their inability to appropriately calibrate their responses to environmental stimuli. This is true even when one has not experienced any trauma, whether physical, emotional, or psychic. It is especially true in the aftermath of highly intense stressful experiences, stressful experiences which come in rapid succession, or those stressful experiences which must be endured a long time. Any of these may precipitate the tendency of the body's adaptive mechanisms to "get stuck in a groove."

The sympathetic division of the ANS is responsible for mobilizing the body's energetic resources and directs blood flow to the skeletal muscles which are activated in anticipation of fight/flight responses. This is the neural division which tends to become sensitized.

The parasympathetic division of the ANS has the job of maintaining internal homeostasis through the absorption of nutrients and the elimination of wastes. It is also in charge of the body's reproductive activities. In sum, the sympathetics defend the body through defense or retreat while the parasympathetics maintain a balanced internal milieu within the body.

Since the sympathetics have a tendency to become "stuck" in their alarm function, such a constant state of readiness for action demands muscular contraction. This wastes the body's energy unnecessarily when real danger is not immediately present. It also contributes to the exhaustion of vital resources. Increased muscular contraction affects the normal adaptive functions of the breath wave and the walking cycle by reducing their biomechanical efficiency and their capacity for distributing bodily fluids. Osteopathic research suggests that hypersympathetic activity is a significant accelerating factor in most degenerative disease states<sup>6</sup>.

What is critical to comprehend is that, "acting through the nerves, stressors produce adrenaline and acetylcholine which can influence the General Adaptation Syndrome mechanism selectively at any point, without having to go through the endocrine system" <sup>1</sup>. These chemicals and the concomitant high levels of sympathetic activity generally depress the function of the intestinal tract and many other physiological activities of the viscera.

Consider the analogy that these two divisions function like a bank account. If energy is withdrawn more often than it is put back in the account will become exhausted. This precipitates the need for the body to borrow resources from other energetic reserves. Once relative balance has again been achieved, an individual may become symptom free in what Selye identified as the Resistance Stage. Eventually, however, the energy which had been borrowed must be redeposited or be drawn yet again from other energetic reserves.

This analogy extends to biomechanical strain as well. Distribution of strain is the principal strategy of how the body copes with stress. Selye's General Adaptation Syndrome helps us to conceive of this at the biochemical level. One process blends into the other. Each may contribute to the degeneration of the other. Structure and function are inextricably woven together.

The Adaptive Mechanisms Concept encourages manual therapists to orient their therapeutic efforts toward lowering this level of sympathetic hyperactivity and toward encouraging the neural output of the parasympathetic division. Such an orientation enhances the Flexibility of the Autonomic Nervous System and assists in restoring the body's inherent capacity for a more normal work/rest cycle.

### The Breath Wave

Stress alters the body's breathing pattern. If the stress reaction is transitory the body is usually able to normalize its rhythmic wave. If the stressor evokes strong emotions or if the stressor is of a chronic nature the breathing pattern may "get stuck", and become restricted from its full excursion. Trauma, injury, disease, and shock can profoundly alter one's breathing.

The breath wave serves many dimensions of homeostatic function. It is the mechanism through which we inspire oxygen and ventilate carbon dioxide. Its rhythmic movements of inhalation and exhalation create pressure gradients between the cranium, the thorax, the abdomen and the pelvis and within the vascular channels of the venous and lymphatic vessels. Together with the pumping action of gross motor movement the breath wave recirculates these fluids back to the heart and lungs. Its motion aids peristalsis and assists the heart's pumping of arterial blood. In addition, the respiratory diaphragm functions as a synergistic muscle of practically every movement we make. The full excursion of the breath wave is central to our ability to adapt to stress.

Andrew Still, the father of Osteopathic medicine, was probably thinking of the estimated 27,000 breaths we take each day when he stated that the essence of the disease process emanates from two causes, "want of supply and the burden of dead deposits"<sup>7</sup>.

An issue crucial to every adaptive mechanism is the cost-to-benefit ratio of energy expenditure. If the body has to draw energy from other structures or from its central reserves in order to simply maintain itself, its capacity for effective adaptation is reduced.

This cost-to-benefit ratio applies to the breath wave. The body must expend energy in order to replenish its supply of oxygen. During normal respiration, only 2-3% of the total energy expended by the body is required to energize the breath wave. Ironically, even heavy exercise increases this requirement to only 3-4%<sup>8</sup>.

Articular, visceral, or myofascial restrictions which inhibit pulmonary excursion either by increasing airway resistance or by increasing the viscosity of the pleura and the chest wall may require significant additional energy expenditure. Airway resistance refers to the energy required to move the air along the respiratory pathways. Viscosity of the pleura and chest wall refers to the energy needed to stretch these normally elastic structures<sup>8</sup>.

Clearly, various manual therapy approaches such as muscle energy, articular thrust, myofascial release, strain-counterstrain, and massage may assist in re-calibrating the elasticity of these tissues. Again, structure and function are intertwined.

### The Walking Cycle

Anatomically the adaptive functions of walking and breathing overlap. "Where motion meets breath, the rhythm of one's life is created"<sup>9</sup>. Metaphorically and literally, the mechanical efficiency of our walking determines our capacity to make progress in the world, to stand our ground, to fight for what we want, or to retreat from harm.

Walking is the foundation of our movement patterns. Because it is one of our most frequent behaviors, any dysfunctions which reduce its energy efficiency places a strain on the body's capacity to adapt.

It has been estimated that restriction of one major joint in the lower extremity can increase the energy expenditure of normal walking by as much as 40 % and, if two major joints are restricted in the same extremity, by as much as 300%<sup>10</sup>.

Walking involves the constant interaction between loss and recovery of equilibrium in the field of gravity. As upright beings each step displaces one's center of gravity which then must be restored in a coordinated fashion for walking to be energy efficient. This coordination may be influenced by myofascial adhesions, articular dysfunction, inflammation, neurologic habituation or entrapment, vascular congestion, cerebellar difficulties, or inner ear infections.

Traditionally the biomechanics of the pelvis and lower extremity are seen as the primary determinants of gait efficiency. The determinants commonly referred to are: pelvic rotation, pelvic tilt, lateral displacement of the pelvis, knee flexion, dorsiflexion, and internal/external rotation of the foot<sup>11</sup>.

Any dysfunctions which limit these actions will reduce the efficiency of the walking cycle draining the body of energy which could be expended for other necessary functions or creative pursuits.

However, walking involves a coordination of the entire body. Other factors to consider and to study include the influence of the sacral/occipital relationship<sup>12</sup>, articular dysfunctions of the thoraco-lumbar junction, the coordinated movements of the opposite leg and arm in the cross-crawl pattern<sup>13</sup>, viscerosomatic reflexes<sup>14</sup>, the influence of habituated reflex patterns of normally voluntary muscles<sup>15</sup>. vestibular reflexes<sup>5</sup>. spinal "righting reflexes"<sup>8</sup>, neck proprioceptors<sup>8</sup> and a client's depth perception or clarity of eyesight. Interestingly even after complete destruction of one's vestibular apparatuses and other proprioceptive sources of information an individual can use their visual mechanisms for maintaining equilibrium<sup>8</sup>.

Treatment of a client's walking cycle is generally most effective when implemented from the hips toward the feet, i.e., proximal to distal. Such an orientation appreciates the more common dysfunctions which affect the neurovascular structures. However, many clients possess a history of traumatic episodes related to their feet, ankles, and/or their lower legs. When this is the case the initiation of treatment efforts may be more effective when begun distally<sup>16</sup>.

What needs to be understood is that the stress response inherently involves one's choice of two defensive strategies: the choice to fight or run away and the choice to find a way to peacefully coexist or to simply ignore the source of stress<sup>3</sup>. Regardless of the choice one makes it will involve the physical components of the walking cycle.

## The Perceptual Matrix

Selye recognized that what is stressful for one person may not be stressful to another. Therefore, a client's perceptual matrix is an important consideration.

Anatomically, this orients the therapist to the concentration of sensory apparatus within the cranium and to reflex arcs mediated through the brain stem and the spinal cord. Some of these actions are genetically pre-programmed while others have been conditioned by one's life experience<sup>17</sup>.

Human beings tend to respond strongly to stimuli which even remotely reminds them of emotionally painful experiences<sup>18</sup>. The irony here is that in our "anticipatory vigilant state" we exponentially exaggerate the wear and tear on our bodies by constantly re-stimulating the sympathetically dominated Alarm Stage of the General Adaptation Syndrome.

Even when we recognize that our defensive strategy is no longer practical or effective, we struggle to re-calibrate our responses. Often an individual's belief system may change, but their behavior does not. This author contends that conditioned reflex arcs as well as the conditioned endocrine cascades which accompany them are in large measure responsible for the inner conflict.

## Conclusion

As an endocrinologist, Hans Selye was primarily interested in mapping hormonal relationships involved in the body's biochemical stress reactions. This article describing The Adaptive Mechanisms Concept is a first step toward applying the implications of his research to the broad field of manual therapy.

The author suggests that the goals of most manual therapy approaches can be distilled into a few common goals: 1) identify what's stuck and assist it to begin moving again, and 2) enhance the integrated coordination of the organism.

The three adaptive mechanisms described in this article comprise the primary means by which manual therapy interventions may assist the body to make its self-corrective adjustments. Touch is powerful. When one adds knowledge and intention, the results are even better. Therapeutic attention to normalizing the functioning of the Breath Wave, the Walking Cycle, and the Flexibility of the Autonomic Nervous System will assist each client to better adapt to their individual life stressors and to discover life's purpose and joy.

## References:

- 1) Hans Selye, MD, *The Stress of Life*, McGraw-Hill, 1976
- 2) Stanley Keleman, *Patterns of Distress*, Center Press, 1989
- 3) Hans Selye, MD, *Stress Without Distress*, Signet Books, 1974

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First published as the Cover Article for the Massage Therapy Journal

Full article published Spring 1992, Vol. 31. No. 2

- 4) Michael Patterson, PhD, "A Model Mechanism for Spinal Segmental Facilitation," Osteopathic Annuals, 1975
- 5) John Upledger, DO and Jon Vredevoogd, MFA, CranioSacral Therapy, 1983
- 6) The Autonomic Nervous System: A Review of its Clinical Importance. Course Handout, West Virginia Osteopathic College
- 7) Andrew Still, DO, The Philosophy and Mechanical Principles of Osteopathy, Osteopathic Enterprise, 1902
- 8) Arthur C. Guyton, MD, Textbook of Medical Physiology, W.B. Saunders, 1976
- 9) Robert Fulford, DO, CranioSacral Course, Tuscon, AZ, 1990
- 10) Phillip Greenman, DO, Principles of Manual Medicine, Wilkins & Williams, 1989
- 11) Stanley Hoppenfeld, MD, Physical Examination of the Spine and Extremities, Appleton-Century-Crofts, 1976
- 12) Major Bertrand De Jarnette, "DC, Sacral-Occipital Technique, 1984
- 13) David Walther, DC, Applied Kinesiology, Systems DC, 1981
- 14) Jean-Pierre Barral, DO and Pierre Mercer, DO, Visceral Manipulation, Eastland Press, 1988
- 15) Thomas Hanna, PhD, Somatics, Addison-Wesley, 1988
- 16) NathansJosephs, DO, Myofascial Technique Course, West Palm Beach, FL, 1991
- 17) Michael Patterson, PhD, "The Reflex Connection: A History of a Middleman," Osteopathic Annuals, September, 1974
- 18) Lansing Gresham, Integrated Awareness Training, Cotati, CA 1993

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