Energy Dynamics and Massage Therapy

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A plethora of technique systems exist in the world of manual therapy today and many have their own reasonings. Often times their founders claim special knowledge and teach certain 'patented' procedures. They all have one common basis however, thermodynamics.

A broad definition of thermodyamics is the relationship between all forms of energy and spacetime. In our discussion, the temperature remains constant, not the pressure/volume. Energy dynamics is, therefore, an appropriate name when dealing with warm-blooded animals.

Energy is the capacity to do work and to transfer heat. Internal energy (U) is the energy within a system. It arises from the movement of the molecules making the system as well as the energy contained within those molecules. Entropy (S) is the most likely gross arrangement of all these billions upon billions of molecules and their energy states over a given time. The more combinations that make up this average, the greater the entropy. Whether a biological process takes place or not, (Gibbs Free Energy(G)) is due to the relationship between energy and entropy: the change in free energy equals the change in internal energy plus the pressure/volume change minus the absolute temperature times the change in entropy.

$$\Delta G = \Delta U + \Delta PV - T\Delta S$$

Systems exist in both the macrostate and the microstate. Pressures, volumes, and temperatures define macrostates. In contrast, the movements and interactions of individual atoms and molecules describe a microstate. Energy dynamics encompasses both. In living systems, various states exist in discrete spaces. Together, they form a 'native' macrostate, a conglomerate of closely related energy states in an open system (1). Examples of macrostates within the 'native' state would be pulmonary tidal volumes and fluid pressure within the cortex of the bone. An example in the microstate would be the internal movement of enzymes.

When a process takes place in our body, $-\Delta G$ occurs. This process can be as small and fast as an electron switching orbitals (measured in femtoseconds) or as large and slow as breathing. The circulation of blood, folding of proteins, electical conduction through the nervous system, all metabolic activities, and temperature maintenance are all included.

Warm-blooded creatures absorb energy at a relatively low entropy, process it at a constant temperature and finally release it into the environment at a higher entropy (mainly heat transfer).

Pathology is a change in a particular aspect of the native macrostate (and its substrate microstates). For example, an increase in tissue pressure due to edema would result in higher U, and therefore a change in G. Phenomena such as local blood flow, cell volume, and enzyme action will now be altered. If this new state persists, degeneration takes place and tends to worsen over time. This common pathology is given names depending on where it takes place. Examples in the musculoskeletal system would be tendinosis, enthesopathy, osteonecrosis, and trigger point. Other systems can also be involved in pathologies such as post concussive syndrome, arterial stiffness, chronic prostatitis pelvic pain syndrome, and pulmonary edema.

Effective treatment is the restoration of the involved aspect of the native macrostate. In the case of increased tissue pressure, the goal of therapy would be to lower it. G would then be normalized. Massage therapy can achieve this. By applying pressure to the affected area, the edema will move away. The new therapeutic pressure changes G again, causing the fluid to egress. After the treatment, normal pressure and internal energy are restored.

The following condition demonstrates a practical example of the application of the information above.

Neuropathic pain (NP) is a chronic disabling pathology. It is difficult to treat and affects millions of Americans. Recent studies shed new light on this condition (2,3). More generally, our understanding of disease processes is changing rapidly. Meta-analyses on the research of musculoskeletal conditions have shown it to be weak. New imaging techniques and biochemical analysis coupled with deep learning are revealing pathophysiologies not realized before.

Ion channels and pumps are often altered in the area of the dorsal root ganglia of affected nerves. Elevated pressure here increases the tension of the cell membranes, which in turn affects osmosis and enzyme action across the membrane. (4,5,6) U has increased, resulting in sensitization of the nerve.

The goal of therapy would be to restore U by lowering the pressure and thereby decreasing the cell membrane tension.

The massage therapist applies pressure to the affected part of the nerve. Paradoxically, this will raise U even further but only for a short period of time, during which he edema will thin and move away. Restoration of the nerve should result. The therapeutic pressure may be in the form of traction, compression, torque, or a combination of these.

Energy dynamics explains common pathophysiologies seen in the office. It explains proven mechanisms of action of treatment. It also explains mechanisms of assessment. By understanding these principles, massage therapy techniques will be improved and become less dependent on ‘cook book’ procedures.

There is one significant caveat: This knowledge may go beyond massage therapists’ scope of practice. For example, a chronic infection may be due to a biofilm. Principals of energy dynamics can explain and possibly treat the pathophysiology of biofilms. Most therapists are not allowed to treat infections. The same goes for coronary artery disease. Many conditions may be helped using energy dynamics. Its imperative you stay within the scope of practice.

References

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