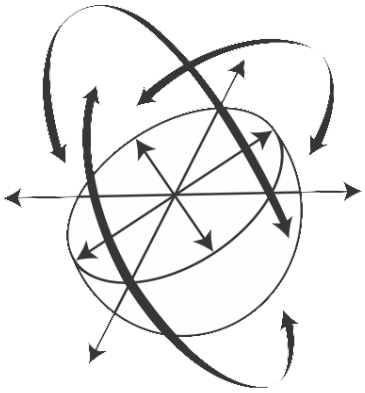

Dynamic
Neuromuscular
Assessment™

The Five Principles of Optimal Movement

Nervous System Response
A normally responsive nervous system is the foundation for introducing beneficial structural adaptation.

Structural Response
Each joint has capacity to respond appropriately to movement.

Technique & Integration
Optimal technique targets the intended movement coordinations.

Adaptation
The three previous principles of movement are the foundation for beneficial adaptation.

Connective Tissue Conditioning
Shift the lens to connective tissue conditioning. This becomes the platform for performance.

Nervous System Response

A normally responsive nervous system is the foundation for introducing beneficial structural adaptation.

Our nervous system is continually monitoring our environment. The vigilance of our nervous system uses both external and internal stimulus to qualify our safety and survival. Even as we live in a digital age, our nervous system still has a priority to keep us safe from potential dangers and predators. This is the job of our sympathetic nervous system, to arm our resources to evade and protect.

A normally responsive nervous system has the capacity to respond, up-regulate and then recover and down-regulate. This is a necessary skill. There is a problem when the sympathetic response does not down-regulate back to the parasympathetic mode of the NS. This is stress regulation.

Under no and low load movement circumstances, our nervous system should be in the parasympathetic mode. This is the rest, digest and recover mode so that our bodies systems can restore. This is measurable through several metrics. When our nervous system up-regulates to the sympathetic mode, our flight, flight and freeze responses activate for protection. The metrics of a parasympathetic response changes at that moment.

There are three categories of metrics we can easily access to evaluate how the nervous system is responding and if those responses are normally responsive. Mechanical receptors behave specifically between the two modes of the peripheral nervous system. Each receptor type has a specific response when they are stimulated. There is also anti-stimulation that should tone down those receptor responses as well. Receptors cease to be normally responsive when the nervous system up-regulates. This can occur locally or globally.

The next category is based on limbic resonance. The nervous system does not have the capacity to lie. That is a product of the mind. The nervous system will respond favorably to truth, and likewise, dis-favorably to untruths. This is why we can have a negative thought and it will affect performance. Fear and

overwhelm will affect motor planning because those thoughts stimulate the sympathetic nervous system. Performance flow state qualifies the intersection of challenges and skills. There is a sweet spot when our movement appropriately challenges our skill set.

The third category is how we neurologically interpret our environment. Motor planning requires three primary inputs: proprioceptive, visual, and vestibular. Our visual processing can be evaluated with a neurological card. How we respond to an X differs from parallel lines II. The X creates integration and the parallel lines create neurological confusion. This neurological confusion is also referred as switching. Mono tasking is another type of neurological confusion.

Acquiring new skill sets, such as motor learning, is best accomplished while in the parasympathetic mode of the nervous system. When we sympathetically arm our nervous system, motor planning becomes limited to what we have already learned in response to an escalating environment. Very few people have capacity to learn new responses while being sympathetically aroused.

I have a saying “you can’t fix dysfunctional movement with dysfunctional movement.” If our nervous system is not normally responsive, any “corrective exercise” is only going to reinforce the source of the inappropriate movement response. We first must restore a normally responsive nervous system before introducing any kind of therapeutic exercise. Thus, evaluating the ability of the nervous system to respond appropriately to movement is the first step in creating an optimal platform to facilitate beneficial motor learning and the positive benefits of adaptation.

Structural Response

Each joint has capacity to respond appropriately to movement.

When we consider the nervous system's communication with the structure as a loop, two aspects of that loop are impacting the other. The loop can start with motor planning or the response to how movement is evolving. Structural response is the latter. This is the array of receptor information that the brain is processing.

I like to think of kinesthetic sense as our felt sense of where our body is in space. This includes load, speed, and vector of movement. Our movement response has a set of receptor inputs that do not relay felt sense. These neurological inputs go directly to the cerebellum. These complete the proprioceptive field of our experience. Mechanical receptors in our joints, ligaments and surrounding connective tissues are relaying this field of information, most of which we are not conscious of. This is how we are able to create complex motor planning sequences, and adjust in seemingly real time, when the evolving environment shifts and changes. An example would be walking on a rocky trail and as the ground shifts we can respond and not fall or strain our joints.

Each joint has its particular range of motion that relays proprioceptive information. When that information is accurate, the sensory motor system can respond appropriately. Conversely, when that information has errant data, the response to that errant data is skewed from an appropriate response. Instead we have a response that is based on protecting the structure from perceived harm.

When we strain or sprain a ligament, the cerebellum will issue motor response that will protect that joint from further perceived harm. It looks like muscle weakness or inhibition. This safety mechanism also occurs when the receptors send faulty data to the cerebellum. A ligament can relay hypertonic input signals when no strain or injury is present. The cerebellum will respond as if there was strain or injury. Resetting these receptors to a normal default has an immediate result in how we move and organize that movement.

Summation of forces is a term that describes how joints and their related connective tissues combine during movement. The more joints that can appropriately combine equates to the greater work potential. If one joint is not participating, this creates a leak in the transmission of work production energy. This leak becomes a maladaptive compensation. Non-centrated joints, muscular imbalances, joint compression, and the incremental onset of joint pathologies are the symptoms of work production energy leaking through the joint/s.

When our joints are available to participate in movement, the load of work production can be spread out across our structure. The more that load can be distributed equates to efficiency. Efficient movement becomes the least amount of energy to produce the greatest amount of work. This differs from effective work. Effective work is developing the greatest amount of work production to distribute across the structure.

Our movement training does both, efficient and effective skills development. However, it must start with appropriate structural response or we will be reinforcing less than optimal integration. This is why joint flossing is a foundational movement practice. Joint flossing restores movement response and develops connective tissue strength and integrity. Joint flossing is both active recovery and strengthens the nervous system's capacity to respond immediately when a changing environment requires appropriate response.

Technique & Integration

Optimal technique targets the intended movement coordinations.

Optimal technique completes our platform for creating the conditions needed for beneficial adaptation from our movement protocols. Kinetic chains and force couplers are the sequencing of structure translating load, vector and speed into work production. Joints are the fulcrums, bones are the levers that act on those fulcrums. The connective tissues of our structure act as the pulley that translates force. The alignment of the fulcrums, levers and pulleys define whether a movement is efficient or effective.

How we organize our structure in movement has two factors. First is conceptual. This is a key aspect of the motor planning stage. We often hear the term “to cue in movement.” Our ability to integrate and perform based on these cues is incremental. Motor learning has three stages: cognitive, associative, and automatic.

Initially learning a new skill is cognitive. There are a few main alignment cues that we have access to when learning a new skill. Initially it may only be one or two cues or we overwhelm the capacity of our attention. The next stage in motor learning is associative. This is when we have the capacity to maintain our awareness on multiple cues. This is the stage where we develop the attention to notice the nuances of the movement. We start to develop efficiency within that movement and notice we can produce more work with the least amount of energy. This translates into either endurance or load capacity. These two attributes are related to the goals of why we are practicing a particular movement. The final stage of motor learning is automatic. Automatic movement skills are movements that we no longer have to think about how we organize our structure. These movements naturally occur when needed, or they erupt out of need. Flow state is an example of movement erupting out of need and is non-thinking. The movement occurs automatically.

The second aspect of how we organize our structure is conditioning. Our capacity is limited by the weakest link in the kinetic chain. Shoring up that weak link will have a huge impact on our capacity. Generally, we tend to think that

muscle strength is the weak link. I would encourage you to shift the lens from muscle to connective tissue. Muscles can develop capacity in a reasonably short period of time, whereas joint strength and connective tissue integrity take longer periods of time to develop. Muscle development is the short game, joint and connective tissue development is the long game. Injuries that set us back are often related to short game goals.

Intention, attention, and awareness play a big role in how effective our movement is towards reaching our goal/s. Understanding what we want to achieve with our movement helps direct our focus onto those three attributes. Without using the qualities of mindfulness when we are practicing, we are inadvertently introducing unknown elements. Our ability to stay focused on the alignment and integration of the work we are producing is the foundation for beneficial adaptation.

Adaptation

The three previous principles of movement are the foundation for beneficial adaptation.

Adaptation is realized in three specific ways, beneficial, neutral, and maladaptive. Beneficial adaption is when the nervous system and structure are optimally integrating in our movement practice. Beneficial adaptation is sustainable. We are achieving our movement goals with positive progress during beneficial adaptation.

Adaptation can also be neutral. This is neither beneficial nor maladaptive. If our adaptation is neutral we are not progressing or reaching our goals. So we might say this isn't an adaptation at all. There isn't enough stimulus provided to the nervous system and structure to elicit a response. We would want to investigate this further to suss out why.

If our adaptation is maladaptive, there are two possibilities. The first being our nervous system is compensating with an unknown or undesirable trait. This would take us back to the top of the list to vet out why there is maladaptive adaptation. The second reason is the need for compensatory movement to restore balance into the structure from our movement programming.

Every activity that we do requires a coping strategy. Coping strategies create adaptation. The intention of compensatory movement is to balance structural adaptation with more desirable attributes. Here we need another shift in our lens.

If our movement work focuses on one particular plane, the other two planes develop a deficit. The adaptation is greater in one set of ranges and is not balanced with the other two. We need to work on all three planes simultaneously. This is what the DNA logo illustrates. The functional compass not only represents movement assessment strategies and joint flossing sequences, the functional compass also represents balance between all three planes of movement and how each joint participates in that balance.
Back in 1994 I coined the term functional opposites to advance the limited viewpoint of agonist/antagonist relationships. The agonist/antagonist

relationship only referenced the particular joint of focus. It doesn't account for regional interdependence. Kinetic chains describe how our movement occurs from the total summation of joints participating. Regional interdependence describes how one region of that kinetic chain is overworked, and other parts of that chain are underworked.

There is a need to further tweak our lens and escape the limited Newtonian geometry of viewing function in the body, and arrive at a more nuanced concept. The body doesn't move in a linear fashion. We can't focus on one plane of movement without affecting the others. The body moves in spirals as it winds up elastic energy into connective tissue and releases that elastic energy into the complementary spiral. This shift requires kinesiologists to develop a new language to describe human movement. Coach Sonnon has done a superb job of analyzing movement and categorizing movement with the aeronautical terms pitch, roll and yaw. Any combined movement of pitch, roll or yaw creates a spiral.

Pitch is the movement around a dynamic fulcrum oriented to the sagittal plane.

Roll is the movement around a dynamic fulcrum oriented to the coronal plane.

Yaw is the movement around a dynamic fulcrum oriented to the transverse plane.

The concept of compensatory exercise is to restore balance across the structure through the lens of pitch, roll, and yaw. If you have a structural adaptation in pitch for example, you would also need to balance roll and yaw. Ideally, you would engage these ranges of motion before a deficit is developed. This is where traditional gym training falls short. The movement paradigm is limited in scope and doesn't consider balancing the attributes we have discussed. Fortunately, more and more trainers are incorporating a modern lens of movement and movement integration.

Connective Tissue Conditioning

Shift the lens to connective tissue conditioning. This becomes the platform for performance.

Connective tissue conditioning is the long game. This is when or training is focused on bullet proofing our joints and developing the elastic properties to store and release elastic energy.

Many years ago I had a conversation with the head of the kinesiology department at University of Utah. His specialty was lower extremity gait mechanics. In the animal kingdom, human's have relatively inefficient use of stored elastic energy. The fastest land animals have up to 40%,whereas humans have between 10% -12%. By increasing our ability to use our connective tissue more efficiently, we effectively boost our performance.

Boosting human performance has been the goal of martial arts for eons. Coach Sonnon has incorporated those principals into his training philosophy. Joint integration, load distribution, summation of forces, and developing stored elastic energy that can be efficiently translated into the opposite movement are fundamentals to a performance oriented training program. These are also aspects of taking the brakes off our movement.

Our nervous system acts as a governor for movement. The NS is monitoring and regulating work production. It puts the brakes on to keep us safe. By incrementally taking the brakes off, we see huge gains in performance. This is why nervous system and structural response are at the very top of the list to create a platform for optimal movement.

Movement training for connective tissue conditioning has two aspects. The first is joint integrity. Without the joint having optimal availability to respond, our nervous system will inhibit progress. Joint flossing and the incremental loading of our joints throughout an appropriate range of motion is our baseline. With integrity established, joint speed becomes another variable. The faster a joint can cycle through opening and closing, the more potential elastic energy can be stored and translated.The second aspect are the ligaments, tendons and fascial system. The four primary fascial springs of gait have huge potential to

increase the efficiency of storing and releasing elastic energy. Top performance athletes use plyometrics as a training tool. We have to load the tissues so they can express potential through the opposite action. This combines both the stretch reflex and the elastic properties of connective tissues structures.

The important consideration in connective tissue conditioning is being incremental in training approaches. The adaptation of connective tissue is much slower that the muscles that would act on those tissues. If muscle development out paces connective tissue development, the potential for injury increases. That is why connective tissue conditioning must be the slow game.

Conclusion

When we watch a really talented athlete perform their craft, it is hard to discern the amount of training that went into their development. For instance, when we watch a gymnast on any one of their four apparatuses, the physicality of their performance elicits strong feelings. The effort feels like ease, time seems to slow down for them as they can compact more movement into smaller increments of time. Their movement flows in spirals and the human potential brings a sense of awe to the observer. This is a product of both talent and conditioning. The five elements I have outlined become the recipe for performance. The ingredients for that recipe are as varied as the spectrum of sports and activities that we all love to participate in.