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Following the chain of motion

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This article is the second installment in a series about SPIFFER, the model I developed for teaching movement evaluation in my classes and workshops. SPIFFER is a framework for making explicit and rigorous observations of human movement from a Feldenkrais perspective. The first article presented the reasoning for using a systemic approach to the evaluation of movement and introduced one evaluation parameter: initiation. After reviewing some basic ideas, this article picks up where the first one ended to introduce another variable: sequence. In this article, I propose that sequence is of fundamental importance to the Feldenkrais approach and offer a set of exercises for learning more about it. As you read on, please keep in mind that everything I say is a result of what I have learned in training and ongoing study, in conducting my practice, and in teaching--it is all provisional. Refinements and improvements are most welcome.

Let us continue with the project we began in the first installment of this series: to explore a precise model of the way we, as Feldenkrais teachers, look at and understand movement. My purpose in clarifying what has previously been vague or haphazard is to offer a way of speaking to each other and to others interested in our work, a way of speaking about movement, that complex phenomenon that confounds so many attempts to discuss it. Of course, a model is, necessarily, incomplete. A model can only explain certain facets of that which it models, clarifying these aspects and obscuring others. For example, a weather map can help decide what kind of garden to plant, but it would not tell how to get from here to Chicago.

Studying an explicit observational approach gives us a means of training perception and refining our ability to articulate our observations. However, please remember that this is only one way of observing and describing; it is by no means the description. Alone, without an embodied

understanding of movement--and the intuition and aesthetics that come with this understanding--exactness is a poor substitute for understanding.

In "Beginning at the Beginning," I stated that the primary difference between the Feldenkraisian view and orthodox biomechanical or medical analyses is that we have a systemic, dynamic perspective rather than a reductionistic, static one. Instead of finding the cause localized at a site or situated in a position, we look for how a problem, or limitation, exists in the context of the person in motion. We situate the problem in a pattern, in that stubbornly consistent configuration that underlies movement, which we call a person's habitual way of moving. The question at the heart of our work is "How does this problem, this limitation, live in the student's movement?"

In the first article of this series, I began to address how we can be specific about this kind of habitual movement, making a distinction between what the person is doing and how they are doing it. I suggested a systemic point of view as the foundation of our perspective. By systemic, I mean a perspective that recognizes and respects the integrity and unity of perception, action, intention, and environment.

A system consists of elements in relationship such that they form a unity, an integrated whole. Any description that emphasizes the elements is inherently reductionistic; as Heinz von Foerster has stated, in reductionism "parts are created and relations are cut." If we want to understand how someone moves as a functional unity, we must look at relationships. Now, which relationships should we consider? The body consists of many elements and sub-systems that change in relationship to each other as we move: the nervous system, muscles, and bones, as well as the digestive, circulatory, and respiratory systems. To answer this question, consider that every system consists of two kinds of relationships: variety and constraint. Variety refers to all the possible changes that the system can make without disintegrating while constraints describe the relationships that restrict the system and, therefore, determine the variety. In other words, variety means the systems possible states and the constraints refer to its limits.

In order to understand how a person moves, we compare how he or she is moving with how he or she could move. We compare the variety at the moment to the potential variety; in other words, of all the options available, which ones does the person use? To make such a comparison means we have to know what is possible. To know what is possible, we have to know what isn’t, we have to know what constrains human movement. We have to discriminate between those relationships that have the potential to change and those that do not, that is to say, between relative and absolute limits on movement.What constitutes the absolute limit on human movement? The absolute constraint on human motion is the structure of the skeleton and the joints, that is to say, the shape of the joints and the length of the bones. These determine how we, as a species, can move. The skeleton is the blueprint for human movement: it delimits the ways we can move and defines our shared inheritance, the domain of possible action.

So taking a systemic approach leads us to considering the movement of the bones rather than the activity of the muscles. This is very different from the standard kinesiological analysis, which emphasizes the action of muscles. However, a muscle-by-muscle breakdown orients us to a reductionistic kind of analysis. While the muscles are the engines of movement, it is the bones and joints that give rise to the shape of movement. Without a skeleton to pull on and without bones to move, the contraction of muscles would resemble the quivering of a jellyfish. In well-organized functional activity, the bones do not move simply one upon the other as individual levers. Instead,

the sekelton’s action is unified. Observing the motion of bones and joints, we find global patterns emerging that involve the entire skeletal network in a coordinated fashion. Any local analysis misses these global patterns.There are over 650 muscles in the body, each made of hundreds or thousands of muscle fibers. This vast number of elements leads to an amazing collection of variables to consider, especially for a movement as complex as opening a door. By taking the skeletal perspective, we reduce the number of elements under consideration to 210 bones. Since movement through space is what interests us, we need only concern ourselves with the fewer than 180 bones that have axial joints. Considering most of these articulations are constrained--that is to say, that they have limited degrees of freedom--the skeletal point of view simplifies movement evaluation. It is these limitations, these constraints, that give our movement its characteristic human form, distinguishing us from all other creatures.

Taking a skeletal perspective also gives us a way to talk about what we, in the Feldenkrais world, generally refer to as differentiation. Differentiation refers to the level of refinement--or complexity--of a movement. In an undifferentiated movement, someone uses only a part of his or her potential options. This notion of differentiation relates directly to the terms I am proposing here: the variety of the movement--the level of differentiation--relates to the absolute and relative constraints--to how free the movement is in relationship to how free it can be. An undifferentiated movement is one in which the mover does not use all the variety--all of the possibilities--available in a specific action. In other words, an undifferentiated movement is one in which the movement is more restricted than the skeleton requires it to be.

(In our work the concept of differentiation does not refer simply to a category of movement, but rather it links behavior to sensation, action to perception. One of the great leaps of genius that Moshe made was understanding that undifferentiated movement is linked to undifferentiated perception. Our approach of refining kinesthetic self-perception and developing awareness is founded on this insight. This link is crucial, allowing us to relate what we notice as observers to what the mover experiences.)

So systemic observation and the Feldenkrais perspective both bring us to the skeletal approach: observing the skeleton and noting the movement at joints. Once the initiation of a movement--the beginning place--has been clarified, we can ask, "Where does the movement go?" In observing someone opening a door, we can follow the arc of the arm through space and trace the trajectory of the shoulder as the door opens. Alternatively, we can notice the sequential movement from the arm through the shoulder girdle, continuing to the spine. As you can see, the question has two answers: one that follows the movement into space and another that tracks the motion through the body. In this article, we are investigating the second of these answers: sequence, the chain of movement through the skeleton.

Observing where movement begins and then asking where the motion goes in the body, we compare an actual movement with the possible movement. That is to say, we ask how the movement we see compares with the potential movement at all the joints involved:

- What is moving?
- Which joints that could be involved in the movement are moving and which ones aren't?
- Does the mover use all the joints available to him or her?

Is it enough to say that a movement is relatively differentiated? Which joints should, optimally, move during a particular movement? To answer these questions, we must ask what the skeleton is designed to do. Usually, the functions of the skeleton are given as support, protection, attachment for muscles (or levers for action), and production of red blood cells. This catalogue would be the correct answer on tests in most anatomy classes. But the list misses the systemic aspect of movement: the transmission of force. If I initiate opening a door by moving from my center (moving my pelvis and shifting my weight to begin the movement), how does the force generated by my large, central muscles reach my arm? Does it travel through my muscles? Organs? Bones?

Movement is not haphazard and the skeleton does not move in a piecemeal fashion, joint-by-joint. Skeletal structure is central to the integrated mechanical design of the body. If there is no interference, a movement that begins in one area flows sequentially through the entire skeleton. In mechanics, this relationship is referred to as linkage. Linkage is the determinate relative motion of two elements in a mechanical structure. Using the word "determinate" emphasizes that the relative motion is determined by the shape of the joint, the underlying structural constraints of the skeleton.

As a movement happens, this determinate movement of force through 2the entire structure forms a kinematic linkage. Kinematic linkage emerges from the connectivity of the body's bony components and from the way in which this connectivity creates specific dynamic relationships. The resulting sequence of movement is the consecutive flow, or entailment, of the links in the chain of the skeleton. These linkages, or pathways, appear when we look at how bones fit together to transmit force through the skeleton; the skeleton provides the "railroad tracks" that force rides. Linkages arise from the interconnection of bones that modify and direct motion along a specific path.

Simple machines usually have only one linkage, only one chain of motion. When you put a key in a lock, you want the mechanism to move in a determinate way so that the door opens. The skeleton is a more complex mechanism--one that does more than one thing--and, therefore, it contains many potential pathways or sequences. This must be the case if the skeleton is to make more than one kind of movement and if it is do so efficiently.

Considering the sequence of movement through the skeleton leads us to considering how each link in a particular chain--each joint on the path--participates in the movement. Here we have a kind of bodily communism that informs our vision: in looking for an action where the movement is distributed throughout the chain, we look for each articulation to play its part in the movement. In any particular action, an efficient, global movement depends on the movement coming, to borrow from Marx, "From each (joint) according to its ability."

Of course, the sequence is not simply a matter of each joint moving independently. Each joint contributes to the overall movement. Joints have a funny kind of dual role: they are intersections--places where direction can change--and they are connections--places through which force travels. If the force goes into the joint rather than through it, then there is a "traffic jam," a place where the force generated by the body is working against the body rather than moving it or imparting motion onto some object. Think of someone pulling on a door with great tension in the shoulder girdle--the person pulls more on himself than on the door.

I suggest kinematic linkage, or sequence, is one of the basic concepts in our work, one that gives us access to the biomechanical logic upon which the design of the body is based. The way in which we can elicit a functional pattern through skeletal structure so that the muscular system reorganizes

itself is, I believe, based on the central nature of these linkages. Remember, Moshe was trained in mechanics and engineering, so he would certainly have learned this fundamental concept. When he began to study Judo and look for ways of understanding this martial art's global movement patterns, kinematic linkage was a concept that would have been readily available to him.

How can we learn about these pathways through the skeleton? Unfortunately, models of skeleton have inexact mechanical approximations of joints. These crude joints do not allow for normal movement and, consequently, the models cannot exhibit global pathways of movement. To learn about these dynamic properties of the skeleton, we must study Awareness Through Movement lessons. Many ATM lessons, especially those about movement through space, are based on differentiating, clarifying, and coordinating motion along a specific sequence. Indeed, I would propose that one thing that makes a lesson a lesson is that it follows a specific pathway through the skeleton.

For instance, let's take a look at a lesson that we all know fairly well: "Coordination of the Flexor Muscles and the Extensors," Lesson 5 from Awareness Through Movement. This is the lesson where the students start by crossing their legs and letting them sink in the direction of the top leg. What sequence, or linkage, is this lesson about? By crossing the legs, the hip joints become constrained so that rotation cannot happen where the legs attach, but must instead occur in the spine. As Moshe points out in the lesson, no more than minimal turning happens in the lumbar spine due to the structure of those vertebrae. This means that the pelvis rolling to the side transmits rotational motion through to the thoracic spine. By following the movement through the skeleton, we begin to see one aspect of what the lesson is about: twisting movements in the thoracic spine. (Can you relate this theme to the later parts of the lesson?)

After having done a lesson, we come to a better idea of how a movement involves the whole skeletal system and how each link plays a part. We have a better idea of the absolute limits (like the lack of rotation in the lower back) and of the potential variety inherent in this, or any other, movement. This is particularly useful later, when we observe someone else move. Using what we learned from our experience, we can compare what is possible--which joints move, how each participates in the movement, and how the overall motion emerges from the individual contributions--with how the person moves. This comparison gives us a contrast between what is possible and what is happening, letting us know where the person could move but does not. Barring deterioration of the joints, diseases of the soft tissue, and structural anomalies (either natural or iatrogenic), we know that the places that do not move are places where the muscles--and, therefore, the nervous system--interferes with the mechanical potential of the skeleton.

Let me suggest the following explorations for learning to see and understand sequence. As I said in the first installment in this series: learning to become a better observer requires distinguishing the dimensions of action. You might want to begin by reviewing what you learned about initiation and then move on to observing sequence. Once you are ready to do these exercises, please confine your observation to sequence.

¨ Study an ATM lesson to learn about a specific sequence. For instance, what is the sequence of skeletal linkages that underlies the classic "Arm Circles" lesson? What is the pathway of movement from bone to bone? In order for the hand to make a circle around the shoulder, what has to happen at the shoulder joint and the sternoclavicular joint (where the collar bone attaches to the breast bone)? How do the ribs and mid-back move? How does that movement effect the pelvis? What

happens at each hip joint? Understanding the contributions that each link makes in the chain can help you hone your observational abilities. That, in turn, can give you ideas of what to do to make a lesson more effective when a student is having difficulties with a particular movement.

To learn more about how joints move, check out The Body Moveable, by D. Gorman, and The Physiology of Joints, by I. A. Kapandji. Both of these books are excellent references.

¨ Find a comfortable place from which to observe people opening a heavy door. Notice how each person reaches for the door: once the handle has been grasped, watch how each person moves to impart motion to the door. After you have ascertained the initiation of the movement, can you follow the path of force through the skeleton? If the initiation is distal, what is the sequence through to the torso and pelvis? If the initiation is central, how does the force reach the arm and the door handle? What moves? Which joints must, therefore, be moving? What does not move that could? Where is there interference? Begin by looking without being intent on finding the precise point, just watch using your peripheral vision.

If you can do this with colleagues, the discussion can be a good way to begin to notice what you notice and what you miss. (You might even consider video-taping so that you can watch the same person several times.)

¨ In a group of three, take turns observing one person opening a door. One observer looks at the movement from several feet away. The other person "goes for a ride" by unobtrusively putting his or her hands on the mover, with eyes closed. (As always, it is important that the "toucher" maintains a comfortable, stable configuration so as to reduce tension in the hands and to allow for easy tracking of the mover's action.)

After observing the person open the door several times, the observers discuss what each has noticed, attempting to converge on a description of the mover's sequence. Rather than arguing about who is right, each can say what he or she noticed. It is especially important to discuss what specific sensory experiences serve as the basis for your observations. Talk only about what you directly perceive, without trying to second guess the mover's thoughts or intentions.

Can you relate what you notice to specific ATM lessons and the sequence that underlies each? For instance, how does opening a door relate to the sequence found in the Arm Circles lesson? To the sequence of the Coordinating Flexors and Extensors lesson?

After discussing what you notice and, perhaps, returning to observing the person open the door a few more times, switch roles. It is, of course, possible to observe someone doing another movement, such as rolling from lying to sitting. However, before switching activities, observe each person in the triad perform the same movement so that you can begin to notice the details that are responsible for our individual differences.

After everyone has taken a turn at all the roles, you may want to discuss which way of observing--watching or feeling--is easiest for each of you. Do you notice how each mode of observation is different for each observer? This exercise structure makes it possible for you to differentiate touch and sight; that means you can start to appreciate differences in your observational abilities and begin to develop your skills.

With these exercises, you will begin to master the second facet of the SPIFFER model. Notice what kind of questions this way of observing brings up for you and your colleagues. What is noticing sequence good for? What are its limitations? In the next articles in this series we will turn our attention to the path of movement through space. After exploring the first three SPIFFER variables--initiation, sequence, and path--we will investigate their interrelationships. All that is for later; for now, I invite you to become acquainted with sequence and the part it plays in understanding movement.