TONIC FUNCTION:
A Gravity Response Model For Rolfing Structural and Movement Integration

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Abstract:

The author summarizes the foundational principles of a theory of tonic function as presented by French Rolfer Hubert Godard. The model of tonic function focuses on the gravity response in the human body as a unifying principle for what has been called intrinsic movement. This principle is a way of distinguishing much of what is unique about Rolfing Structural and Movement Integration. The factors affecting gravity response can be identified for purposes of clarifying how Rolfers work to evoke intrinsic movement. Further, the model can be used to help organize how RSI and RMI is taught.

Rolfers make a life study of relating bodies and their fields to the earth and its gravity field, and we so organize the body that the gravity field can reinforce the body's energy field. This is our primary concept.

—Dr. Ida P. Rolf[1]

A Spectrum of Gravity Issues

The founder of Structural Integration, Ida Rolf, emphasized the importance of gravity in considering the evolution of human potential. She implied that the importance of understanding gravity was missing in the osteopathic approach.[2]

Throughout their respective histories, the martial arts, tai chi, yoga, dance theory, and other schools of body movement have talked about optimizing the body's relationship to gravity. The relevance of gravity in Rolfing Structural Integration is often expressed as either alignment (leading to economical accommodation to gravity), or in terms of the further structural changes made by gravity as it acts on a more integrated structure. Rolfing Movement Integration historically has emphasized gravity-related strategies such as allowing gravity to "do the work," letting gravity lengthen the fascial net, and "letting down to go up." The latter is an unexplained but effective idea widely shared among movement specialists. Do these important ideas in fact fully represent the significance of gravity? I think not. Although Dr. Rolf was not the only one to point it out, the Rolf Institute view of the importance of gravity is still unusual in the body education/therapy field.

We don't know what Dr. Rolf's exact vision was, but it was frequently expressed in terms of the human relationship with the gravitational field. In trying to make sense of her insistence on this fundamental point, we can examine it through physics, or metaphysics. We can also look at it from a biological point of view by examining gravity as a fundamental factor influencing the physiology of creatures who live in a gravitational field. Of the attempts to propose a foundational model for Rolfing, the gravity-biology approach is well suited for finding coherence among the disparate ideas and techniques that Rolfers master in order to be competent.

Why Have a Model?

The ideas here presented are in large part derived from the work of Hubert Godard. Many Rolfers are already aware of some of his concepts

and observations. This paper outlines why this material seems important, not just as a discipline for learning how to see and to elicit changes of function in clients, but more importantly, as a theory which illuminates the difficulties of defining Rolfing. Rolfing is a complex domain, and our mission of telling the world about it is not simple. Our students have experienced the effects of Rolfing, so they take it on faith. But they face the challenge of expressing it to the world as practitioners. How might we best teach Rolfing to students and then describe it to the world? For some of us, Godard's model has provided clarity to the complexity while at the same time staying faithful to the core ideology of Rolfing: gravity and the logical principles of the recipe. This paper addresses the gravity issue.

Hubert Godard's original degree is in chemistry. He became a dancer and ultimately a dance teacher, and then a teacher of dance teachers. The responsibility of teaching teachers is a challenge that includes articulating very clearly why certain teaching techniques work. I think this background is partly why Godard's work is useful. In addition, it is tested in the competitive world of dance performance and in rehabilitation work at a hospital in Italy. Godard's willingness to look for physiological grounding of movement theory allows him to demystify some of it. (Much of it remains mysterious because there is much we still do not know about neural control of movement.)

When working with clients, movement theory grounded in physiology or physics is not necessary. Clients still appreciate our work without the theory. However, designing a curriculum for people who are going to teach students or teachers, a task that involves theoretical debate, becomes more rational and effective when the work has some basis in science. If instruction is to be more than teaching techniques, if we want our students to be able to create new techniques as the situation arises, instruction must always stress principles rather than technique. Rolf Institute faculty members have recognized this need and taken steps in this direction.

Optimal Function

Before considering gravity, it is important to ask what the goals of Structural and Movement Integration are. Our methods and model should reflect our goals and vision. A discussion of our goals should lead to a description of optimal functioning. From the point of view of a dancer, athlete, or actor, optimal functioning includes being able to quickly adapt to changing needs for movement. It may include being able to jump with no apparent exertion. In performance, we evaluate the capacity of the performer to execute a move accurately, competently, and aesthetically. For daily life, the goals may be more simple: to be free of pain, to move pleasurably and without strain, to recover quickly from exertion. In any of these examples, we as somatic therapists are claiming that an improvement in function is important and possible.

We base this improvement of function on certain principles that are not explicitly agreed upon, but generally include the following: minimum rigidity of the body, effectiveness of movement and appropriate strength, subtlety of locomotion (i.e., the kind of movement in which it is difficult to perceive what muscles are doing the movement), contralateral spinal function in walking, free full breathing, and so on. Everyone has their favorite ways to describe optimal function. While there is no right movement per se, in each situation there are challenges to which each body must react and adapt. The capacity to adapt broadly and freely constitutes a general criterion for successful movement. This capacity can be defined more exactly in each specific movement situation. The critical focus of this article, however, is on what underlies adaptive capacity and successful movement.

Gravity

Generally, unsuccessful movement happens with little or no capacity for using the gravity control system of the body. When the movement control system responds automatically to gravity or to circumstances that mimic gravity, it does so much more economically, effectively, and pleasurably than when control is purely voluntary. Certainly it is often not a simple matter to assist people to find this automatic response. Usually we succeed at gaining small changes in functioning by using a combination of structural analysis, structural soft-tissue manipulation, visualization, breath work, movement practice, verbal negotiation, rapport, and so on. When these multifarious interventions are viewed from the perspective of affecting the gravity control system, we gain a greater clarity about why they are effective tools.

The entry point to a discussion about gravity is recognizing that human beings evolved as gravity-sensitive creatures. At birth, we leave a fluid environment and enter an environment where we are in a upward and downward orientation with reference to the earth's gravity field. We are prepared to negotiate this new world because we carry within us a complex control system that reacts to gravity and allows us to orient and move and assume postures. The immediate relationship with gravity must be negotiated along with the relationship with mother. As a result, gravity response becomes inevitably linked with the relationship with mother; the two are layered together. As Bonnie Bainbridge Cohen succinctly points out: "Nerves myelinate

in order of importance for survival. . . . Of all . . .cranial nerves, the first pair to myelinate . . .are the vestibular nerves. . . . That the vestibular nerves begin to myelinate first indicates that they perform the first essential function for survival—before the need for registering touch to the head, taste, smell, hearing and vision."[3] Before we orient for nourishment, we must first orient for movement in the gravity field.

The foundations of all movement and orientation are controlled by the part of the brain and nervous system that are dedicated to keeping us upright whether we think about it or not. Gravity response is first in sensory development and it is always invisibly present in everything we do. For example, if, when standing, you are told to raise your arm in front of you, what are the first muscles to contract? Muscles that control movement of the arm are not the ones to contract first, but rather it is the muscles of the ankle and leg that anticipate the need for balancing the changed center of gravity that will result from the reaching arm.[4] (This exercise demonstrates that movement in relation to the gravity response is set before we move and cannot be changed by direct voluntary control. Only by changing perception, emotion, or the meaning of the situation can we change the setting of the gravity response. We cannot learn by imitating a model of optimum movement to move in an optimal way. The form of the right movement depends on the construct of each person and the way that person feels his or her body and the surrounding space, and the way he or she categorizes the situation.[5]

All the responses we are looking for as Rolfing Structural and Movement Integration practitioners are linked to the gravity response. The link between gravity and optimal function has been hinted at in Jeffrey Maitland's beautiful use of the palintonos concept: earth and sky and the sense of length or span in two directions; the body as an event energized by this polarity.[6] But how do we ground palintonic lines in physiology/kinesiology? Some of the more critical responses to the palintonic picture are, I believe, an appeal for more specificity and a linking up with the common scientific language.

Relevant Physiology

How does the gravity response operate in the human body, and how do the many aspects of Structural Integration and Movement Integration relate to gravity response? One of the first concepts we need to understand is the stretch reflex. Tonus in muscles that hold us upright is maintained without higher brain control. Stretch receptors monitor tonus by sensing the change in fiber lengthening. The stretch receptors are of many different kinds. In his article, "The Potential Disruptive Influence of Somatic Input," Keith Buzzell describes a wide array of stretch receptors that provide a continuum of information to the spinal cord, information regarding not only how much but also how fast muscles are stretched, and with what acceleration.[7] (The Golgi tendon organs are intentionally left out of this discussion, in order to focus on aspects of the gravity system that link with brain function.) This feedback system can adjust tonus in muscles without our conscious awareness.

The anticipation of movement is already a movement. The anticipation of movement is a task sorted out by the cerebellum in response to input from other parts of the brain. It is then controlled and monitored in the muscles through feedback receptors. In the example above, the intention to move the arm tells the soleus to tighten. If we extend the example further, how does that tightening of the soleus affect the whole body and its quality of movement?

Those muscles with a relatively greater number of stretch receptors (spindles) are tonic in function.[8] Tonic muscles are able to burn oxygen more efficiently than the phasic muscles, which allows them to work slowly and steadily for long periods of time. In addition, they have a control function over phasic muscles. They coordinate the work of the phasic muscles. The soleus will exert a regulatory function over the tibialis anterior; the hamstrings will exert a regulatory function over the quadriceps. Tonic muscles regulate because they are more densely endowed with stretch receptors. As a result they can differentiate subtle levels of contraction in themselves and their antagonists. Contraction in the phasic antagonist will produce a very precise reaction in the tonic agonist. When the gravity response control system organizes movement, the tonic muscles' greater number of spindles make them better equipped to receive the control information.

Also, tonic muscles have the capacity to influence the threshold of excitation of the stretch reflex in the whole body, to varying degrees, by influencing the level of charge in the medulla and the reticular formation.[9] If the threshold of excitation of stretch reflexes is low, (meaning there is a high charge in the medulla and the reticular formation), then the body will be tight, generally speaking. If the threshold is high, the body will be softer. The feedback loop works in both directions and has the potential to be positive: high charge in the reticular and medulla makes the stretch reflex more sensitive, which in turn can be further provoked to elicit higher charge; lower charge makes the stretch reflex less sensitive, and by eliciting further lengthening it can continue to lower charge.

"Reduced reflex response", "increased reflex response", "softer" and "tighter" are not descriptions of inherently good or bad states. Rather they are descriptions of

the capacity of the body to adapt quickly to changing circumstances. When these adaptations are economical, integration is the result. Gaining the capacity to recruit the needed response is our goal. For example, by coaching a client with very tight hamstrings to allow the spine to lengthen, the straight leg can be brought close to the face. (This hamstring lengthening exercise is an impressive demonstration used by Godard to illustrate this point.) In this instance tonic muscles of the spine are released, creating a generalized lowering of stretch reflex sensitivity. As a result, the hamstrings are allowed to lengthen with much lower resistance. (The reticular formation has, in fact, been influenced by messages from the densely spindled muscles of the spine, and also from the cortex and limbic system which interpret the sensory cues and sense of direction as a signal to calm down the body's general tonus.) When one set of tonic muscles releases, other muscles are able to release more easily.

Conversely, when testing a healthy subject for a patella reflex, if the two hands are pressed together in an isometric contraction, the reflex should be faster and stronger. Tonic muscles that are held tight can facilitate stronger and quicker contraction in other muscles.

In both cases described above there is an implied hierarchy of kinesiological control. Also, in both cases, the situation influences the reticular formation by signaling higher brain functions to sense need for action or need for rest. More will be said about lengthening the spine later.

A second way of using the gravity response exists. There are two categories of motor neurons that can innervate muscles: alpha motor neurons and gamma motor neurons. Alpha neurons are controlled in two ways: by direct voluntary control and by indirect control via the gamma motor neuron, or what is known as the gamma loop. Ultimately, the alpha neurons do the work—it is important to keep clear on this point. However, direct voluntary control by the cortex is very different than indirect control through gamma stimulation of spindles in the muscle feedback points. (Godard points out that a very small percentage of total alpha neurons are employed for motor innervation. Vastly more alpha neurons are involved in interpreting and processing perception. This observation regarding the role of alpha neurons is important for how we teach movement. To best use the alpha system, we direct the client to notice sensation, or feel direction, rather than imitate a form that elicits primarily alpha motor response.)[10]

Gamma loop initiation of movement happens when a movement is conceived and executed in the cerebellum and the medulla as a result of the body's response to spatial orientation.[11] The gamma motor neuron uses the same stretch receptor mechanism to accomplish contraction as would occur from the stretching of the spindle in the interfusal fiber, but it does it directly by neurologically stimulating contraction of the spindle. When a gamma motor neuron is fired, the spindle contracts, lengthening the surrounding annulospiral ending and triggering the reflex even though the muscle has not been stretched. (The annulospiral is lengthened in a normal stretch reflex when the muscle and its adjacent spindle are stretched.) Thus, the gravity response of the muscle feedback system can be enlisted in a situation where staying upright or maintaining resting tone may not be an issue, and where the muscle has not been stretched.

In the direct control situation (alpha only), there is an experience of effort and, at some point, fatigue. In the indirect loop (gamma), there is little experience of effort and fatigue, in the same way that we don't feel the soleus contracting to keep us upright. Eventually the soleus will tire, but we won't feel it very much.

Further, gamma loop muscle enervation more effectively deactivates antagonist activity. That is, the muscle opposing the intended action is quieted when the gamma system is engaged. Or, to state the reverse, when the cerebral cortex controls the motion, there is often unnecessary antagonist response. Thus, more effort is used, which is counterproductive to the intended action.

A well-known example is the "unbendable" arm. A subject holds her arm out straight,

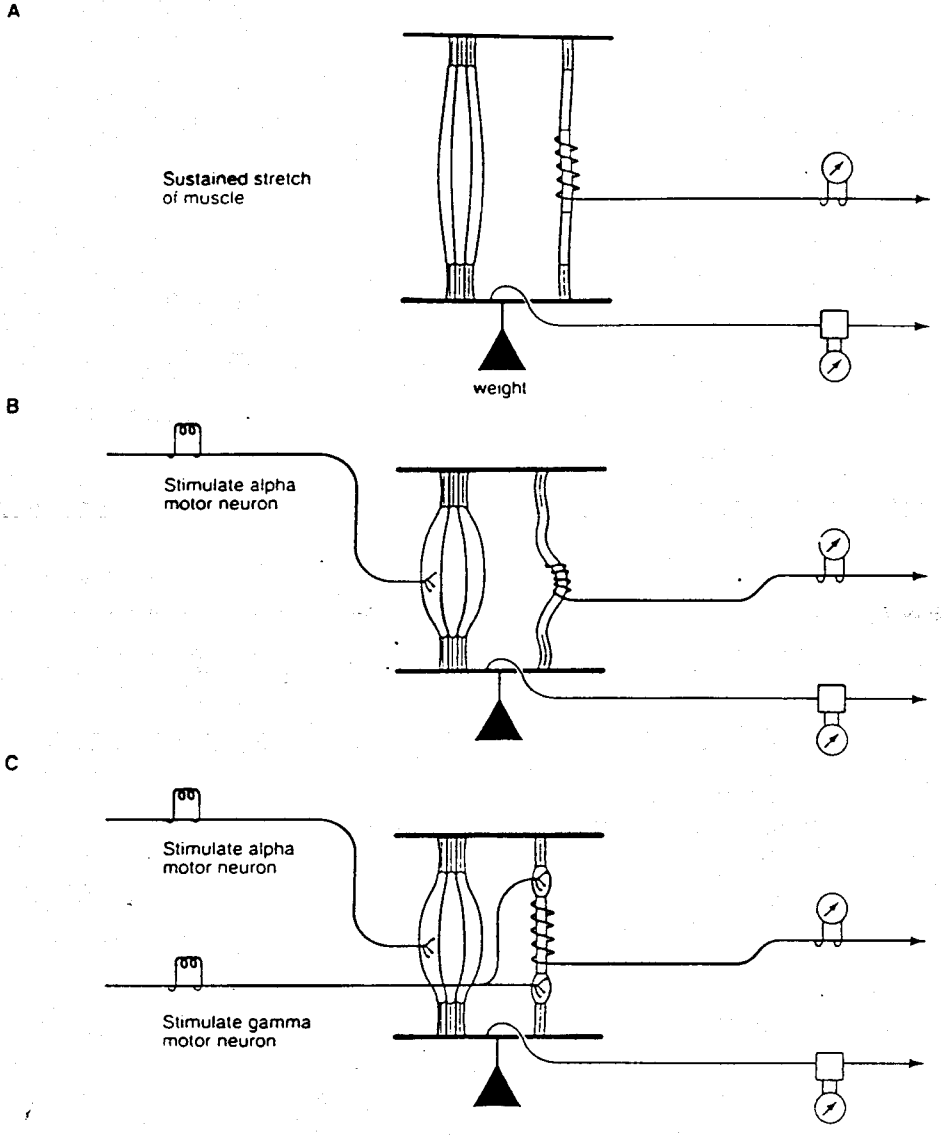
Diagram of muscle spindle during alpha contraction of muscle, gamma loop contraction of muscle, and stretching of muscle

In this simplified diagram, three conditions of muscle contraction are illustrated:

A. shows the muscle being stretched leading to the spindle being stretched, which in turn lengthens the wrappings of the annulospiral ending. This condition will precipitate alpha neuron stimulation of the muscle. This is the action of the stretch reflex.

B. shows alpha neuron stimulation of the muscle (as a result of A. above or some voluntary action) which in turn slackens the spindle and shortens the wrappings of the annulospiral ending. This action will turn off any reflex initiated alpha stimulation of the muscle.

C. shows gamma neuron stimulation of the spindle which then contracts, and by so doing, lengthens the wrappings of the annulospiral ending. This lengthening stimulates the contraction of the muscle via alpha neuron. [12]



her hand on the shoulder of the tester. She is told to not let the arm bend as the tester applies downward force. The arm cannot resist bending. When the subject is told to reach to the wall behind the tester, the arm is stronger and can easily resist bending. Godard has used electromyography to show that, in the first instance where the subject is using effort to keep the arm straight, the biceps (in this example, the antagonist) is engaged and active, as are the (agonist) triceps. The action is inadvertently sabotaged by the antagonist muscle. In the latter case, the reach impulse did not elicit the antagonist resulting in greater effectiveness. The gamma motor system is posited as being responsible for this more efficient use of muscles. The gamma loop is activated because the cortex delegates the task to the spatial orientation part of the brain, which in turn employs the gamma loop to activate the alpha motor system.

Dr. Rolf referred to this phenomenon when she made the statement, (that ideally) . . . "when flexors flex, extensors extend." [13] We could describe this condition as a purer functioning of reciprocal innervation. Reciprocal innervation functions well when we do not sabotage it with our voluntary, and hence less discriminating, alpha commands.

To summarize: using the gravity response system for movement leads to movement that is more effective, has less effort, is likely to minimize counterproductive contraction

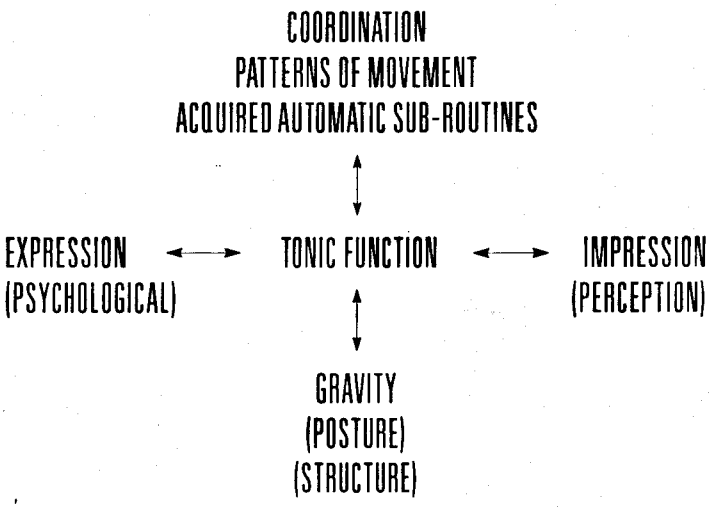
of antagonist muscles, and allows for greater subtlety of control. The movement cues of Structural and Movement Integration are designed to evoke these qualities. Clearly, these principles already implicit in many of our techniques.

The Model

The next step in assembling a picture of tonic function is to spell out the categories of intervention that underlie optimum gravity response. One way to organize our work or our curriculum is to work toward articulating a model that can include the complexity of the phenomena we are trying to teach. I propose that the criteria for evaluating such a model be: that it embraces the diversity of techniques that practitioners use, both in classes and in practice; that it successfully predict outcomes that we, in fact, observe; and that it is linked to the scientific paradigms surrounding the physiology of movement and structure.

This model of tonic function makes sense of the major categories of Rolfing structural and movement work. It is a way of restating the unique synthesis of methods that have at their center what Dr. Rolf saw as, "gravity, an unexplored factor in the human use of human beings".[14] (Italics added.) Tonic function is a description of the factors that are consciously or unconsciously negotiated when attempting to change the quality of function in a person through Rolfing. All of these elements are potential entry points for change in the gravity response of the body. The scheme is charted below.

Basic Tonic Function Scheme Diagrammed



(All these factors affect tonic function and each other. Movement also is affected in turn by other factors, primarily the individual's memory and the environment or situation, but I am choosing to ignore those for the purpose of this discussion.)

This diagram shows four categories that formalize the four entry points into tonic function. We work with gravity and structure as a way of restoring adaptive capacity in the fascia. We move fascia strategically to allow the body to rearrange itself in relation to gravity. Posture can be a symptom of movement patterns that have not optimized use of the gravity control system. Until some of that commitment of the tissue is changed, it is much more difficult to access a sense of letting go of over-corticalized movement.

The other factors are also part of how we as Rolfers work. Impression or perception refers to how the person is taking in sensation. What parts of the body are afferently alive and what parts are missing? Proprioception is a trigger to the gravity response and control system. When there is a rich experience of sensation in the skin, especially in the hands and feet and face, it seems to stimulate gamma activity in motor control. The influence of proprioception on gamma activity explains why many of the changes we observe come about as the result of merely teaching the client to pay attention to sensation. The act of paying attention to sensation is already a movement, and it is a movement that can affect the quality of subsequent movements. Emilie Conrad D'aoud's Continuum work is, among other things, a demonstration of how sensory perception changes movement.

Perception also refers to what we imagine, and what we perceive outside our bodies. When I attend to feeling the weight of my sacrum, it can change how I stand, and how I walk. I can also perceive, through the imagination, the space above me, the sky, and that perception evokes a change in the muscles of my body. The quality of tonus in the muscles will also change according to whether my vision is focused, or peripheral.

So impression is both inside (which is about the relation with autonomy) and outside (which is about the relation with the world). The inability to have both categories of perception active at any given time, limits the capacity for the gravity response system (tonic function) to govern movement, consequently limiting adaptive capacity.

Expression refers to our observations that clients can be either controlled or inhibited in their movements, depending upon whether there is a natural flow of expression. An example is the expression of sound, which is a consequence of a breath pattern. If we invite the client to sing or talk in a way that is fun or familiar, the response may include a less cortically controlled action of the diaphragm. The release of

diaphragmatic control is akin to moving from what Laban called "bound flow" to "free flow."(15.) Expression, the free movement of a person outward into the environment, is a contradiction to inhibition, which in turn manifests as a change in the tonus of the diaphragm. We frequently observe that when there is a release of the diaphragm from unconscious or conscious cortical control, the movement possibilities in the tissue and in the locomotor system change. The consideration of expression shows the importance of understanding the psychological aspect of our work. Inhibition on a psychological level shows up as inhibition of the diaphragms. One way to approach this sort of inhibition is to create a possibility for expression that is not bound.

The gravity control system is prevented from optimally functioning in movement as long as there is inhibition of expression. When diaphragms are committed to a predetermined fixation of movement, similar to contracted tonic muscles, the spine is unable to lengthen and the gravity response mechanism is largely preempted.

Coordination, or skill, has to do with the learned aspects in a client's evolution. The kinds of coordination that are evident is a factor, and the establishing of new skills becomes the foundation for allowing the gravity system to function. The operative word here is "allow", for much of the inhibition of the gravity system stems from preemptive control by the voluntary (alpha motor) system.

Much of the skill we teach our clients is the use of cortex to inhibit parts of itself. The cortex is not an evil thing. We could not sit still and read this paper without choosing to inhibit impulses so that we can focus our attention. Corticalized movement, so called, is the lack of cortical inhibition of over-control.

Developmentally, we must learn bound flow of movement to have some control over our environment and our bodies. As Rolfers we teach our clients the next step in this developmental process, which is developing skills for inhibition of control that stands in the way of tonic function. Automatic subroutines are acquired throughout life—many are learned very early. Some skills, missed early in childhood, are quite difficult to teach to adults, precisely because coordination is so deeply embedded in the conditioned reflexes. Undoing reflexive behavior must be approached through the principles of perception and symbolic coloration.[16]

An example of this teaching process is found in the injunction to allow sitting bones to "slide back" in the sitting process. In their understanding of Normal Function, Hans Flury and Willi Harder teach skills that permit fascia to load, in order that muscles can relax.[17] But the teaching process has to focus on the feeling of the sitting bones, the sense of weight, and the sense of the direction back and the corresponding direction forward, in this case the lengthening of the anterior of the trunk. Facilitating coordination means teaching perception, because it is often the act of perceiving sensation that changes efferent activity. Showing someone a movement—showing them a form—is often the "end of movement," as Godard is fond of saying. When we teach a movement through feeling sensation, there is less chance of installing a new cortical control program, though the temptation to imitate in order to "do well" may persist for the client.

Coordination is really a factor that exists outside of conscious voluntary control. We cannot teach it through instructions that evoke control. Yet, often we try to do so. Coordination can be discovered through attention to perception, changing the symbolic meaning of the movement or the environment in which it takes place. Coordination is the sum total of the work of tonic function. It is the outcome of successfully following the principles of tonic function, and it is also an entry point into tonic function when it belongs to us as an acquired automatic skill.

The purpose of the tonic function diagram is to represent the matrix of factors that we consciously or unconsciously negotiate in evoking intrinsic movement, or movement that optimizes the tonic system, the gravity response system. All of these factors are entry points into intrinsic movement. These factors form criteria for sorting out the pieces of our repertoire for teaching purposes. In practice, our work is usually a constant shifting and blending of all these tools.

Lengthening of the Spine

With this summery of part of the model of tonic function in mind, I want to return to the notion that the tonus of the muscles that flex, extend, rotate, and sidebend the spine are also a central focus of tonic function. The principle states that a reduction of tonus in the muscles that control lumbar and cervical lordosis have an especially propitious effect on tonic function, and therefore on intrinsic movement. Stated more simply, intrinsic movement is always initiated by a lengthening of the spine. Where does lengthening specifically take place? Key places of reduction of tonus seem to be the suboccipital muscles of the neck, which are the most densely spindled muscles of the body[18], and the psoas and erectors, which according to Gracovetsky, are primarily regulators of lumbar lordosis.[19] Anatomically and physiologically, we could debate the definition of spinal lengthening at some length (and productively, I suspect). But for purposes of the model of doing integrative work, we observe that a relaxation of the two mentioned lordoses as an initiator of movement leads to enhanced gravity response in the movement, or what we are

calling tonic function. (Notice I have specifically avoided describing joint angle here. Relaxation of tonus in the areas of lordosis is the criterion for lengthening. Thus I am choosing to avoid the controversies about any ideal lumbar angle. The joint angles will be a highly individual and situational event.)

We also observe that there are repeatable experiments regarding what we are calling spinal lengthening. First, it is, of necessity, a response that involves two directions. One direction, one pole, is the sense of weight, the sense of the sacrum as heavy, or the sense of the pelvic floor or the feet as weight bearing. It can also be described as the felt sense of the internal environment. Another way to say this is, "the felt sense of weighty masses within the body." The other direction, or pole, is a sense of the outside—a sense of places in space outside of us or above us: the sky, the ceiling, the felt sense of relationship with people or things. We can observe that successfully calling attention to these two poles of awareness elicits intrinsic movement.

Peter Levine focuses attention on the ergotrophic (E) and trophotrophic (T) polarity in the autonomic nervous system, a concept that is completely congruent with this model. "Trophotrophic" means "attention to, and sense of response from within". "Ergotrophic" means "attention to, and response to, phenomena outside the body".[20] Godard asserts, soundly I think, that there is in fact a genetic predisposition toward one or the other polarity. (One corroboration of this stance comes from the work of Nicholas Gonzales, a physician in New York City who has developed a way to use this predisposition for the treatment of cancer. Gonzales has documented this predisposition through analysis of blood chemistry. There appears to be consistent differences in measurable, persistent physiological data between patients with sympathetic, versus parasympathetic versus balanced autonomic predispositions.[21]

Perceptually, the lengthening response is about two directions, two poles. Physiologically, it is about the necessity for the body to process relaxation of tone as a spatial task involving both attachments of a muscle moving away from one another. In this way, the tendency for stabilizing one of the attachment points via synergist muscles is prevented. Metaphorically, it is palintonic span.

Application of Principles and Model

The truly thorny part of training practitioners of Structural and Movement Integration is teaching them to "see" accurately. To see the particular factors in a static or moving client is not easy; gaining skill at evoking change in these factors is a further challenge. We may see someone's inhibited diaphragm, but what do we do about it? We may see lumbar lordosis increase with hip flexion, but how do we intervene? How we intervene will depend on how we describe the phenomenon and how we describe the change we want—in effect, the language we use both among ourselves, and with the client. In a separate discussion, I will describe the particular interventions that address major movements from the point of view of tonic function. Many of these techniques are similar to what we do already, or reframes of what we do to make them consistent with the principles of tonic function.

The point of this discussion is to more precisely describe what we do so that we can teach it more systematically and consistently than has been done in the past. A systematic set of principles can help us determine if our goals make sense and if they are being met. It could also be an approach to organizing how we do the pre-training and life sciences training that accompany the Integration training process. That is, the components of training a gravity-response specialist, a Rolfer, follow from the model. We start to see how physiology has specific goals within the domain of our work. We see that psychology is not about psychotherapy but more about the symbolic factors affecting gravity response, and so on. Hans Flury and others have admonished the Rolf Institute to engage in strict thinking about what we are doing and why, so that we may better see if Dr. Rolf's unique vision is fully appreciated and developed. I think Hubert Godard's synthesis is another step in this direction.

Footnotes

[1] Rolf, I.P. *Ida Rolf Talks*, (Feitis, R. ed.) Rolf Institute, Boulder, Co., 1978, p. 86.

[2] Ibid., p. 171.

[3] Cohen, B. B., "The Action in Perceiving," *Contact Quarterly*, Fall 87, p. 23.

[4] Reed, E. S., "Applying the Theory of Action Systems to the Study of Motion Skills," Reprint of author, Dept. of Humanities and Communications, Drexel Univ., Phila., Pa. p.53.

[5] Godard, H., paraphrase of portion of private corres-pondance.

[6] Maitland, J., "The Palintonic Lines of Rolfing", in *Rolf Lines*, Vol. IXX, No. 1. Jan./Feb. 1991, pp. 1-2, 43-49.

[7] Buzzell, K. A. "The Potential Disruptive Influence of the Somatic Input", in *The Physiological Basis of Osteopathic Medecine*, The Postgraduate Institute of Osteopathic Medicine and Surgery, New York, 1970, pp.39-51.

[8] Godard categorizes muscles as tonic or phasic by four criteria: number of spindles, empirical function, amount of fascia, and proportion of slow twitch versus fast twitch fibers. The categories overlap so how we define the category will change the analysis.

[9] Azemar, G., "Neurobiologie des Comportements Moteur," Publication de I.N.S.E.P., Paris, p.55. Also Lectures by Godard, Phila, Pa. 1991-94.

[10] Wiesendanger, M., *Journal de Physiologie*, Paris, 1976.

[11] Juhan, D., Job's Body, Station Hill Press, Inc., Barrytown, N.Y., 1987, p.214.

[12] Gordon, J., and Ghez, C., "Muscle Receptors and Spinal Reflexes: The Stretch Reflex," in *Principles of Neural Science*, 3rd Edition, Kandal, E. R., Schwartz, J. H., and Jessell, T. M., Elsezier Science Pub. Co., New York, 1991, p.572.

[13] Rolf, I. P., *Rolfing*, Healing Arts Press, Rochester, Vt., 1989, p. 65.

[14] Rolf, I. P., *Rolfing. Structural Integration. Gravity: An Unexplored Factor in a More Human Use of Human Beings*, Rolf Institute, Boulder, Co., 1962. (Especially pp. 17-19)

[15] Free flow and bound flow refers developmentally to the infant first moving without control, only out of impulse, and then accomplishing control over movements so that she can grasp or do some other goal oriented motion. The definition is that originally of Rudolph Laban, but my familiarity with the idea is from Hubert's lectures.

[16] Juhan, D., p.211.

[17] Flury, H., "Normal Function", in *Notes on Structural Integration*, Sept. 1991, pp. 6-21.

[18] Abrams, V. C., "Neck Muscle Proprioception and Motor Control," in Proprioception, Posture and Emotion, D. Garlick ed., Kensington, Australia, 1982.

[19] Gracovetsky, S., *The Spinal Engine*, Springer-Verlag/Wien-New York, 1988, p. 120.

[20] Levine, P., *Accumulated Stress, Reserve Capacity and Disease*, Ergos Institute, Lyons, Co., 1991, p. 11.

[21] Gonzales, N., Tape of a seminar conducted by Dr. Gonzales at Circle Health, Boulder, Co., in March of 1992. The primary topic of the seminar was the treatment of cancer, but much of the discussion concerns genetic predisposition toward sympathetic, parasympathetic, and balanced autonomic conditions.