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**THE FELDENKRAIS METHOD:
SCIENTIFIC BASIS FOR A NEW CONTRIBUTION
TO REHABILITATION MEDICINE
FROM THE WORLD OF ART**

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INTRODUCTION

The work of Moshe Feldenkrais was formally introduced to the United States in 1950 with his first book, entitled The Body and Mature Behavior (1). Despite a favorable review of his book and ideas in the New England Journal of Medicine (11) in that same year, his rehabilitative approach has not been adequately studied, nor has it been incorporated into routine rehabilitation programs.

Recently, Stanford neuropsychologist Karl Pribram (19-22) was elected President of the Feldenkrais Foundation. This event should aid in the perception of this method as having a legitimate scientific basis.

If this method is to be recognized in this scientifically-based society, its theories and rationale must be expressed in terms in which it can be understood and compared to other methods. If its efficacy could be shown to be the same or better than other methods already covered by health insurance policies, coverage for this method should be provided as well. Problems such as chronic low back pain have such a significant economic cost upon society and the individual that the cost of reimbursing such a method, if proven effective, would more than pay for itself.

The author will present a brief history of this technique, observations of the technique in practice, and a review of neurophysiological and neuropsychological data which suggests how this technique might help with problems which are refractory to routine rehabilitative modalities.

HISTORY

The history of the Feldenkrais Method is similar to that of the Alexander Technique (145), though following it by 50 years. F. Matthias Alexander was an actor who in the late 1800's developed vocal problems which could not be resolved by the medical establishment of his day. He undertook a detailed, critical analysis of his movement patterns and posture, and ultimately found what he called "The Alexander Principle". This principle states that there must exist a certain relationship between the head, neck and torso in order for proper motor functioning to occur. This principle could not be adequately expressed linguistically and had to be demonstrated.

Though Alexander's technique quickly gained popular appeal, (despite his egotistical manner), it was not until such prominent intellectuals such as George Bernard Shaw, Aldous Huxley and most significantly John Dewey began to advocate his teachings that he gained a legitimacy.

Likewise, the Feldenkrais Method began when its creator, Moshe Feldenkrais, at age 30 began developing problems with his knee after an old soccer injury flared up. At that time, the risks of surgery were significant, and the results not promising. Feldenkrais had strong background in science-- he had received a doctorate in applied physics at the Sorbonne (in France) and subsequent degrees in electrical and mechanical engineering. He worked on the French atomic research program (with Nobel Prize-winning physicist Frederic Joliot-Curie), and in 1940, when Germany invaded Paris, he escaped to England. He had also received a black belt in judo.

He began an intensive study of anatomy, neurophysiology, learning and developmental theory and ultimately uncovered certain principles that helped him heal himself as well as others.

The publication of his most popular book, Awareness Through Movement, by Harper and Row in 1972, heralded the beginning of the practice of Feldenkrais' Method in the United States.

Feldenkrais personally taught and certified three groups of people. The first group of 17 were taught in Israel in 1974. The second group of 65 were trained in San Francisco in 1977, and the third group of 200 in 1983 in Amherst, Massachusetts and Israel. The Feldenkrais Foundation founded in San Francisco in 1977 by Feldenkrais, has protected the term "Feldenkrais Method" and the names of his techniques "Awareness Through Movement", and "Functional Integration" with a service mark to maintain a quality level of training and practice.

Prominent personalities who have studied with Feldenkrais include Israeli Prime Minister David Ben Gurion, violinist Yehudi Menuhin, anthropologist Margaret Mead, and Karl Pribram.

Recently, comparisons have been made between the work of Feldenkrais and that of psychiatrist Milton Erikson (158-161). Erikson is best known for his extraordinary ability to use language to affect change in his patients through unusual hypnotic techniques and the now in vogue "paradoxical" therapy (see section on Feldenkrais and Hypnosis, below).

Since his death at age 80 in 1984, training is by video tapes of his classes and instruction by his students. Over the last five years Feldenkrais' work has gained increasing recognition throughout the United States, as well as the world. Several of his pupils, such as Robert Masters (161, 162) and Iliana Rubinfeld have gone on to develop their own methods.

METHOD

All therapies are the same in that they provide their patient or client with some experience, and that experience is supposed to provide some enduring positive change. In certain cases the effects of therapy are obvious. It is easy to conduct a study when the therapeutic experience provided is the lifting of weights and the resulting change is gain of strength. However, when it comes to problems of pain, neurosis, and other aspects of human experience that are hard to define and prove, likewise it is hard to define and prove any change.

A second problem in the understanding of a therapeutic modality is the relation between language and experience. There are certain experiences that language cannot express; likewise there are certain abstractions that can only be understood with symbolic language and can not be experienced with the body. On this basis, it is unscientific to state that an experience is not valid because it cannot be defined with scientific terminology. Very often the experience of change is non-linguistic--it is felt but not expressed. Furthermore change sometimes occurs without being experienced or observed. The universe is filled with changes that the human mind and sensibility cannot experience nor express.

Based upon this reasoning, the author enrolled in a series of movement classes, with the hypothesis that dancers experientially know things about movement, kinesiology and neurophysiology that scientists sitting at their desks do not. The author hoped to share such experience, and then correlate his observations with the scientific data at hand to yield new understandings of the human nervous system. The author has studied several movement systems; this paper is limited to the author's experience of the Feldenkrais Method.

In attempting to elucidate the "principles" of this Method, and its creator's ideas, the author attended a class in the Feldenkrais Method for over two years (see below for description). In addition to taking these classes, reading all of the available original works by Feldenkrais (1-8) and secondary works (9-18), the author has received several lessons of the individually oriented Feldenkrais lessons called Functional Integration. Finally the author has held a series of discussions with one prominent Feldenkrais practitioner, and less formal conversations with another.

The author comes from a background in medicine, with research experience in psychology, perceptual neurophysiology, and computer science, and is working on a method, which while in agreement with the Feldenkrais Method, takes a different approach. All this is stated to reinforce that the author has no personal involvement with this method or any of the others that he has observed.

The author is in no way claiming to represent the viewpoint of the Feldenkrais himself or his practitioners. Indeed Feldenkrais' writings themselves are also not representative of the experience of his method--they succeed in capturing his ideas, but not their application. One practitioner has also recorded aspects of the Method on paper (15) with some success.

THE FELDENKRAIS METHOD IN PRACTICE

Feldenkrais considered his method a form of teaching, not therapy. His method is "taught" in individual lessons called "Functional Integration" and group classes called "Awareness Through Movement". The individual sessions were the first to evolve historically.

The basic premise of the work is that unlike most animals, whose actions are essentially instinctive and inborn (phylogenetic), most human action, such as the use of language or the manipulative skill of the hand are learned ontogenically--through experience. Through Feldenkrais' lessons, one kinesthetically explores and discovers one's habitual patterns of movement. Through such awareness habits can be changed and new movement patterns can be found. Such new patterns can be helpful in reducing chronic pain, spasticity and other disabilities, and/or can be used preventively to allow better use and function of the body.

In order to gain such kinesthetic awareness, Feldenkrais advocated beginning by laying on the floor to avoid activating anti-gravity neuro-muscular processes. He also encouraged his students to begin with very small, repetitious movements which only increase in magnitude after the student has achieved a certain level of awareness.

What the author will do is break down the experience of the Feldenkrais Method into a dozen or so principles, describe the experience of the principle, and then present neurophysiological data which supports such a principle. Some of these principles are not new--many can be found in other forms of training. However, it is in the way they are integrated and applied, and their potential maximized, that makes the Feldenkrais Method unique.

PRINCIPLES OF FELDENKRAIS

1) The Feldenkrais Method is a form of learning, not therapy or exercise.

The word "exercise" commonly implies that the method is repetitious practice of a new pattern and the goal is strength, endurance, and the formation of a new habit. The Feldenkrais Method is not exercise--the movements are never strenuous, do not build physical or strength or endurance, and favors perceptual awareness and the breakdown of patterns. "Therapy" is sought to solve a problem, and thus all work is judged as a success or failure with respect to such a goal. On the other hand, "learning" and "growth" are lifelong processes that are not unique to the disabled. It takes an olympic athlete twenty-five or so years to develop a skill to perfection; how long should it take a person with a new deficit, or who is trying to change a pattern? This method advocates such a philosophy by encouraging the student to be curious about how his body works now--not how it should work. The student is involved in a process of discovery and experimentation, rather than forcing results. To the use the expresion of the late anthropologist Gregory Bateson (101-106) (whose wife, Margaret Mead studied Feldenkrais), this method both teaches the student and helps the student "learn how to learn".

2) Both the teacher and the student must be aware of, respect, and work with the "anxiety pattern" of the body. Removing the effects of gravity by working on the floor (laying down) aid in decreasing the predominance of the anxiety pattern.

Feldenkrais' concept of the "anxiety pattern" is similar to Wilhelm Reich's concept of the "body armor" (155, 156). Essentially, as an individual's early life experience leads to the formation of psychological habits (character structure), early experience also leads to physical habits. These psychological and physical habits are actually one psychophysical entity.

Routine "psychotherapy" involves talking with ensuing affective experience and therapeutic changes in the character structure of the patient. Likewise, movements of the body can "release" emotion and create change.

The author has observed that just as a child learns to take on the parents' personality structure, so does he take on certain physical characteristics of the parent. This is not genetic--the shape of the body may be different, but the movement qualities are similar. Very often the child learns to "keep tension" in the same areas of the body as the parent.

Closely related to the "anxiety pattern" is work on the vestibular system. The vestibular sense, commonly referred to as the sense of balance, is mediated by the semicircular canals (the membranous labyrinth) in the middle ear (93-95). The sense of balance, and its loss, the sense of falling or dizziness have extremely powerful emotional responses because of a close neurophysiological and neuropsychological relationship between the vestibular and emotional systems (98-100). The vestibular system is closely related to hearing both evolutionarily and physiologically. This is why we dance to music. The vestibular system also controls eye movements, and has been implicated as a cause of dyslexia (92). The work of Dr. Jean Ayres is based upon the premise that the vestibular system helps organize all sensory systems, and that many children with developmental and learning disabilities can benefit from stimulation of the vestibular system (90-91).

By laying on the floor, vestibular input is decreased, by not needing to balance. Thus the diminution of the "anxiety pattern" by laying on the floor can be explained through this system. (Likewise, patients in psychoanalysis are required to lay down to foster "regression" to a period where they could not stand, thus evoking early emotional memories).

3) The body works as a whole. Any part of the body can move, feel and affect any other part. To a greater degree, by way of symmetry, one side can affect the other side.

Just as the distinction between mind and body are abstract, so is the breakdown of the body into regions and organs. Physiologically, the body works as a whole. There are extensive neurological and chemical connections between all the parts of the body, and recent data suggests that organs minimally related conceptually, such as the brain and gut, have extensive neurochemical connection (166, 167). The concept of the whole being greater than the sum of its parts is well-established in Gestalt Psychology (42) as well as Systems Theory (138, 140A).

Mechanically, the body works as an entity as well. This is why people with low back problems also develop neck problems, and that in general a problem with one joint or region will tend to cause problems in other regions. Just as part A can negatively affect part B, likewise part B can positively affect part A, if given the correct circumstance. While in medicine, the tendency is to "go where the money is"--to avoid esoterics and treat the obvious, in Feldenkrais, very often the affected part is the last to be approached, first teaching and affecting it by movements of other parts of the body.

This is especially true with respect to the right-left symmetry of the body. The connections between the two sides are extensive, and it has been shown experimentally that a damaged partion of the brain can permanently alter the function of its symmetric, organically intact counterpart (60). It is just as well pssible, though not yet proven, that the good side can affect the bad.

Often, Feldenkrais would only work with one side of the body, and intentionally leave the pupil feeling asymmetric in order to maximize the learning from such a feeling.

4) The characteristics of an aware movement is reversibility and differentiation.

Very often, our conscious experience jumps between actions, while we are unaware of intervening moments. A common example is getting into a car and the next thing finding oneself home. Another example is preparing some food, and the next conscious moment, discovering the plate empty with minimal conscious recollection of how it got that way.

This type of phenomenon happens continually with our movements. We decide to climb the stairs, and the next thing we are there. Or we decide to sit down or stand up. If one slows down one of these movements, such as sitting down, one finds that there is often a point of irreversibility--a point of discontinuity, where one loses control of the movement. In the case of sitting down, at a certain point one loses control and falls into the seat, even if the fall is only an inch or so. The motion has an ensuing staccato or abrupt quality.

The opposite of this is a motion which is reversible--in which the speed and direction can be changed at any point. Such quality reflects the organisms efficient and conscious control of movement.

The ability to differentiate goes hand in hand with reversibility. The ability to feel a difference between, say, when a joint is bent to 59 and 60 degrees clearly lends to greater fine-tuning of the neuro-muscular system.

The author often uses the analogy of a television set when explaining the importance of differentiation and small movements. With a television set, one may be on the right channel, but just a very small turn of the fine-tuning dial can make a large difference between perfect image and a distorted one. Most of us haven't had the chance to fine-tune our nervous systems. Dancers, in their early training must use mirrors to see where their arms and legs are, because they can't feel themselves sufficiently to attain balance or the necessary line.

If one thinks about all the abrupt, jerky, forceful motions one makes each day, and the trillions of movements one makes in a lifetime, the incidence of arthritis and other musculoskeletal problems is not surprising. Even a very small change over seventy years can amount to a significant effect.

5) The smaller the movement, the more the potential for awareness.

Feldenkrais' scientific explanation for his work was limited to this principle, based on the Weber-Fechner Law of Perception (45). Essentially, this law states that there is a constant ratio between the intensity of a stimulus and the just-noticeable-change in that stimulus that one can detect. If, for example, the ratio is one-tenth, and one is holding a 20 pound weight, one could feel a change by 2 pounds, but not 1.5 pounds; Whereas if one is holding a 2 pound weight, one could feel a change of 0.2 pounds. For each sensory system, this ratio is different, and it is also affected by attention, training, and the speed of the change. However, in general, if one wants to be able to feel small changes, one must make small movements.

The author has discovered another important way that small movements are essential for conscious awareness, based on recent neurophysiological data (23-38). This recent data demonstrates that the region of the brain that is responsible for conscious motion (the motor cortex and pyramidal tracts) only works by initiating small movements, and of low force. Once a motion is initiated, the majority of the motion is essentially controlled by a non-conscious, pre-programmed system. This is experientially true--we remember initiating an action, and find ourselves at the end, but don't know what intervened (see above examples and discussion). In order to regain conscious awareness and control this data suggests, one must break down a large movement into a series of small, conscious steps, in order to reprogram this automatic sequence. Many movement systems such as ballet and karate do this--break down the motor patterns into components. However, even a relatively simple motion such as moving the arm against gravity is actually a large movement with respect to the neurophysiology--all the spinal musculature must be activated in order to support the weight of the arm. By laying on the ground, eliminating the anti-gravity muscle tone, and tuning down the perceptual systems as discussed above, only then can such initiating sequences be experienced and modified.

This is also why very often, body treatments in which the patient is passive--such as manipulation, pills, massage--are of limited effectiveness on a long-term basis. Without active, volitional exploration and modification of habits that have evolved and been reinforced over a lifetime, these habits will cause a recurrence of a problem, though temporarily relieved.

6) Eye movements assert an organizing effect on movements in general.

Part of a movement pattern is the movement of the eyes--which very often direct and reflect the action (41, 44). There is a direct neurological connection between the eye muscles, the head, neck, spine and vestibular system (through the Medial Longitudinal Fasciculus and other pathways (95)). Thus, coordinating and exploring the relationship between movements of the eyes and other parts of the body can have a beneficial effect.

7) The individual as a whole, and every part of the body has its own particular oscillating frequency, or rhythm. This rhythm can change from moment to moment, but is always present, and can be used to teach.

The body has inherent chemical, endocrine, neurophysiological and mechanical rhythms. The most obvious includes the sleep-wake cycle and walking. Considering the body a mechanical mass of rigid and elastic substances, each part, and the body as a whole, has its best oscillating frequency. When a part of the body is subjected to such a rhythmic oscillation, be it self-generated such as breathing, or externally provided in the form of a rhythmic push, such a motion will involve the entire body in the rhythmic motion, if all regions are relaxed. A rigid region of the body will not oscillate nor conduct such an oscillatory pattern. Thus applying a rhythmic force, say to the feet, and seeing if the head moves can be instructive. The breathing rhythm can be used to the same end--under ideal circumstances, rhythmic breathing movements can be felt in every part of the body.

8) A feature of a quality movement is that the breath remains deep and is not held.

This concept is common to dance and yoga and most experienced body therapists, though not studied. The important rhythmic aspects of breathing were discussed above.

9) The mind and the body are one. Distinctions between the two are conceptual, not actual, and reflect the philosophy of the society.

This principle is essentially contained in all the above. Just as the concept good cannot exist without the concept "bad", likewise structure (body) and function (mind) are interdependent. They are abstract creations of the human linguistic intellect which tends to work dialectically, but does not reflect non-linguistic experience.

10) There are no principles.

This is similar to the Zen Koan, "What is the sound of one hand clapping?". This principle is meant to illustrate that all concept systems are the product of, and are subjected to the limits of the mind of man. Often the necessary rigidity of our conceptual frameworks blind us to what is right in front of our eyes.

FELDENKRAIS AND BIOFEEDBACK

There are many similarities between Feldenkrais and biofeedback (85-89). Both are forms of teaching--they require and allow the student to become aware of aspects of his function of which he was previously not aware. With biofeedback, the technology translates some aspect of the patient's experience, which he can't perceive, into an auditory or visual signal which he can perceive. With Feldenkrais, the student is using his perceptual systems more effectively, according to the principles outlined above, in order to gain similar new information. Ultimately, biofeedback training must become perceptually based--if one is able to achieve some goal only with a machine, and is not able to bring that new knowledge and experience to the rest of his day, then the technique is of limited usefulness.

FELDENKRAIS AND HYPNOSIS

While the goal of Feldenkrais is conscious awareness, the unconscious plays a large part. If we define consciousness as that of which we are aware, then we have a large unconscious, which involves much of our kinesthetic, tactile, vestibular and even auditory world (especially true in our visually-based society). The "anxiety pattern" can be interpreted as an unconscious process which protects the body from prior harm. Therefore, as one begins to work with the body, one develops

an "altered state of consciousness" dominated by distant memories and emotions. At times it is common for "trance phenomenon" to occur, such as altered states of perception, time distortion, age regression, and the like (158-165). In such cases, learning is taking place--but at a unconscious level. Such trance learning is the prelude to later conscious learning--prior experiences must be explored and reinterpreted in order to allow consciousness to both have access to such memories and to allow conscious change of movement patterns to occur. The ultimate goal, however, is conscious awareness.

RELATION TO OTHER FORMS OF "ALTERNATE THERAPY"

Unfortunately, the history of science is filled with new ideas that have been rejected without scientific basis. Feldenkrais' ideas have at times suffered such prejudice--being tossed in the collective waste basket of alternate therapies that include hair analysis, patterning (147), and others. While a new idea should not be accepted without proof, neither can it be rejected. The best that one can say is that one doesn't know. If one form of "alternate therapy" proves invalid, this is not a basis for rejecting others. Each method must be studied and judged on its own merits, and perhaps on its own territory as well. Scientists would suffer the same fate if all were judged incompetent because of the actions of one.

The creator of the Feldenkrais Method was a Ph.D. and engineer. His ideas are well developed and presented, though often without adequate references. Experientially, it takes only a very brief exposure to the Feldenkrais Method to agree that the lessons cause a definite, though subtle change in perception.

Likewise, many chronic patients end up going to a Feldenkrais practitioner as a last resort--after using up the lot of conventional and alternate therapies including acupuncture and chiropractic manipulation. If a suffering person tries modalities A, B, C, D and E and then receives lasting improvement from modality F, then it is unlikely that such benefit is coincidental or a placebo effect.

Good quality papers are needed,. However, it is better for no studies to be done than poor ones that reach positive or negative conclusions of questionable validity. A case in point is a paper that recently appeared (18). Reviewing this paper, one finds a number of methodological flaws, many of which were conceded by the authors. The publication of this type of paper, with uninterpretable results, simply confuses the issues, lends to misinterpretation by those with a poor research background, and only does harm to the reputation of science and of the method. It is better to wait for quality studies to be designed and conducted.

LIMITATIONS OF FELDENKRAIS' THEORY AND METHOD

1) Lack of research. Though rehabilitation research is difficult because of individual differences, research is needed to both test and prove the postulates in the method, and to allow for correction of flaws and maximization of effect. With proper design, "single-case" research involving a single subject can show a significant effect (141-144). Of course, classic double-blind, matched control group designs are also needed.

2) Lack of range of sensory systems. Over-emphasis on kinesthesia. Feldenkrais' method is essentially kinesthetically and tactilly based. Not enough attention is paid in theory and practice to the vestibular system, the imaginary system, the auditory system, and intersensory processes (50-57) as well.

3) Lack of recognition of the relation between imaginary and actual motion. The author has concluded that this method works at the interface of the actual and imaginary movement (58-61). Though some lessons involve imaginary motion, the importance of imaginary processes and their relation to consciousness have not been adequately acknowledged or discussed by Feldenkrais.

4) Lack of full range of rhythmic patterns. Rhythmic motion is Feldenkrais Method is usually internally generated. The pupil moves at a rhythm which is "natural" to his body. However, most proper function requires work with external rhythms--crossing a the street during a green light, catching a bus, keeping to schedule at work, being able to communicate with another person working at a different "speed". Moving to an external rhythm, such as music, requires and fosters the perceptual awareness, fine-tuning and control that Feldenkrais advocates.

PROGRESSING FROM FELDENKRAIS

With the growing number of people studying Feldenkrais, much basic science and clinical research is needed. Studies should explore the effect of the Feldenkrais Method for disorders such as osteoarthritis, rheumatoid arthritis, stroke, low back pain, and chronic pain syndromes, just to name a few of the ailments that still plague patients and health care systems. This Method should also be studied formally as a method of training athletes, dancers, and the elderly as a means of preventing injury through improper usage of the body. Based upon the limitations discussed above, much work is to be done to apply Feldenkrais' ideas to the vestibular system, the imaginary sensory systems, and using a variety of rhythmic patterns.

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