# DR. ROLF'S AGNEWS PROJECT

Julian Silverman

Approximately fifteen years ago scientists from three independent laboratories formed a team at Agnews State Hospital's Research Department in San Jose, California in order to study the effects of a method of human musculoskeletal manipulation called Rolfing. Their findings were remarkable in a number of practical respects. Today, it appears that the implications of these findings have been largely lost to Rolfers and physical therapists of all kinds. Why this should be so is open to conjecture and it is not my purpose here to speculate about this "why?". Rather my purpose is to re-view this research and to emphasize some of the important implications of this unique project.

In addition to certain overall changes which were found in the sensory physiology and neuromuscular physiology of subjects following the ten-session Rolfing process, other changes were found which were not anticipated by Dr. Rolf and her team of researchers. These changes highlighted the idiosyncratic effects of the Rolfing process on individuals with different types of musculoskeletal organization. Most noteworthy was that the typological differences which were discovered in this study were not based on any pre-existing typology conceptualization in the scientific literature. Rather the typology differences emerged when the data were subjected to a particular method of statistical analysis called "cluster analysis". The subsequent confirmation of these "types" in follow-up segments of the study was extraordinary. The implications of the typology findings for the understanding of individual differences in musculoskeletal organization and for the training of individuals who work "hands-on" with the human body has yet to be systematically considered.

This paper summarizes the results of two separate reports in scientific journals. The reports describe two facets of the Agnew's research project on Rolfing.

## Some Background

During the past two decades, more than a dozen evaluative studies had been conducted on the Rolfing process; a variety of psychological, physiological, and biochemical measures had been employed. Although varying widely both in intent and in degree of methodological sophistication, these studies tended to support claims that Rolfing has a constructive effect on psychological as well as on physical well-being. For example, significant positive changes were reported on such measurements as "vital capacity of respiration", "degree of anxiety", and "level of self-regard". The goal in this paper is not to review these various studies but to focus essentially on the procedures and findings from the Agnews Rolfing Project itself. In the book, "Ida Rolf Talks About Rolfing and Physical Reality", Rosemary Feitis (1977) describes a bit of the background of this Project:

> "In the fall of 1969, one of Ida Rolf's hopes finally came to fruition. Esalen's new research director, Julian Silverman, decided to put together a project to research the effects of Rolfing. We knew from experience that the results were dramatic, but the unrolfed world "outside" was often skeptical...
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> "The 1969 project was ambitious: brain waves (Average Evoked Responses), psychological profiles, blood and

urine samples were all collected before, during, and after ten hours of Rolfing. In addition, Dr. Valerie Hunt of the UCLA Movement Behavior Lab measured muscle potentials at different locations on the body during various activities. All the work was donated by the researchers -- Val Hunt and her staff came to San Jose, Julian persuaded the state mental hospital there to lend us space and their brain wave lab and personnel, blood and urine tests were carried out and analyzed in other labs (on several enzymes such as CPK and SGOT and on levels of 17-hydroxycorticosteroid) and Dr. Rolf and her staff of one took care of the Rolfing and conquered logistics. Adolf's Foundation donated $4000 to help with expenses. We were all set.

"Two years later we were still trying to hunt up a computer that would translate the vast quantities of analog data (squiggles) generated by Dr. Hunt's measurements into digital data (numbers) so that they could be given statistical (scientific) treatment. In other words, we were still trying to find out what, exactly, was shown by all that research."

Actually "all that research" was undertaken as a study of fifteen male subjects, two of whom did not complete the study. The team of researchers was almost as large as the number of subjects; it was composed of several biochemists and physiologists, kinesiologists, psychologists, a psychiatrist, and a statistician. Because the computer programs for analyzing Dr. Hunt's data took a long time to develop, electromyographic recordings were analyzed later and separately from all of the other procedures. This ultimately proved to be a blessing since it enabled Dr. Hunt to independently verify the conclusions derived from the larger body of procedures.

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See for example: R. Sword's "Rolfing Research Overview", unpublished Rolf Research Bulletin; D. Townsend's doctoral dissertation "The Effect of Body Integration on Psychological Functioning", University of Pittsburgh, 1976; V. Hunt and colleague's "A Study of Structural Integration From Neuromuscular, Energy Field, and Emotional Approaches", 1977. These papers can be obtained from the Rolf Institute, P.O. Box 1868, Boulder, Colo. 80306.

The subjects, all males between the ages of 25 and 45, were selected on a volunteer basis. None had any apparent physical or psychiatric disability. The "battery" of electrophysiological and biochemical tests were administered before, during, and after a series of 10 sessions of Structural Integration which extended over a 5-week period. All subjects were processed alternatively by two practitioners, Ida Rolf and Peter Melchior. No subject received more than five sessions from either practitioner. The data for all procedures except the electromyography procedure were analyzed in the various laboratories and then forwarded to Julian Silverman's laboratory for collation and further analyses. In this study, (Silverman et.al., 1973) two kinds of evaluations were undertaken-- 1) general effects and 2) body-type effects (based upon patterns of scores on the various tests).

General effects:

The measurement of sensory modulation.

An ordinary electroencephalogram (EEG) produces a waveform; it is obtained by attaching electronic sensors to a person's scalp and recording the gross electrical activity occurring inside of the person's head. Our special technique involves presenting sensory signals to the person, in this case light flashes. The flashes are presented, one per second. The first half-second of brain wave which occurs immediately following a light flash is recorded and stored in the computer's memory bank. After a number of light flashes are presented, the computer derives an average wave form for all of the wave forms recorded. This wave form represents an average (evoked) response to a large number of signals. Certain characteristics of this wave form are reliable. By varying the intensity of the light flash, using four different intensities, we can obtain information on how people register and modulate stimulation. (The flashes vary in intensity from moderate to moderately strong.)

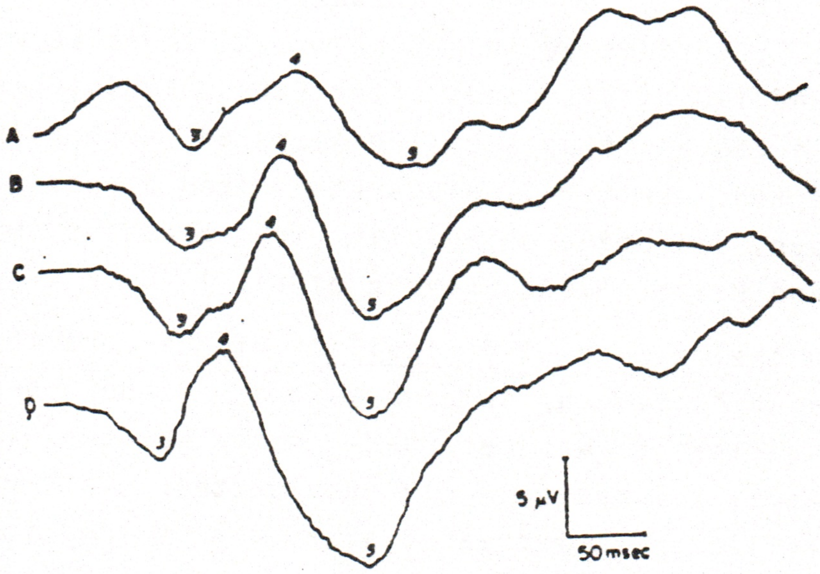


*Fig. 1.* A typical series of AER waveforms to four intensities of photic stimuli [from Buchsbaum and Silverman, 1968]. Note: peaks are identified by numbers following system of Kooi and Bagchi [1964]. Light values in lumen seconds: $A = 32$, $B = 70$, $C = 118$, $D = 980$.

In the main, the results obtained on this procedure after the ten Rolfing sessions were remarkable; indeed, if not for subsequent analyses which substantiated their significance, they might have been dismissed as due to some electrical malfunction in the computer.

On the wave-form amplitude measure, all subjects evidenced increases after Rolfing. The amplitude values are obtained by measuring, for each subject, the distance between the bottom and the top of the first positive peak of each wave form. This is determined for each of the four wave-forms (see Figure 1). We were specifically interested in a peak which occurs between 80 milliseconds and 140 milliseconds after each stimulus presentation. Increases in the amplitudes of the averaged (evoked) EEG responses were expected; earlier findings had linked higher amplitudes with a more open, receptive orientation to external stimulation (Begleither and Platz, 1969; Shevrin et.al. 1970).

On the measure of variability of the more than 100 evoked responses which make up each wave-form, another co-related significant difference was recorded. After Rolfing, variability was significantly reduced as would be expected. This variability reduction reflected an increased stability of the evoked response wave-form; it is linked with a greater capacity for efficient organization of sensory information (Inderbitzin, et.al. 1970; Jones & Callaway, 1969).

Finally, the relationship was examined between changes in EEG averaged evoked response wave-form and changes in stimulus intensity. This relationship is expressed (mathematically) in terms of the slope of the linear function relating amplitude to stimulus intensity (see Figure 2). A high slope, one reflecting relatively large increases in amplitude with increasing stimulus intensity, is termed augmentation. A low or negative slope, reflecting relatively small increases or decreases in amplitude

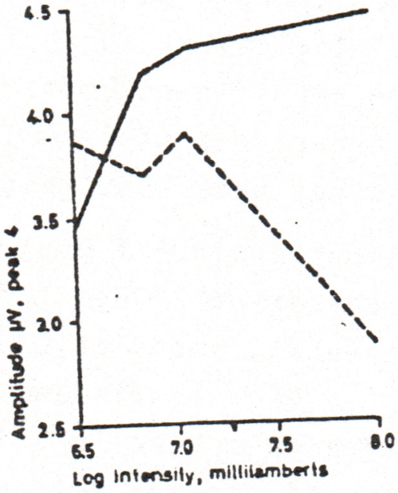


*Fig.* 2. AER amplitude-intensity functions of nonpsychiatric (normal) augmenter (——) and reducer (----) groups [from BUCHSBAUM and SILVERMAN, 1968].

with respect to increasing stimulus intensity, is termed reduction. After Rolfing, the slope of the linear function was found to shift from augmentation to reduction in our sample of subjects. Reduction has been found in hypersensitive normal subjects (Silverman, et.al., 1969) and in hypersensitive drug users and psychiatric subjects (Blacker, et.al., 1968; Bucksbaum and Silverman, 1968; Silverman, et.al., 1969). The results for the Rolf study are summarized in Figure 3.

In addition to these neurophysiological measures of sensory function, a measure of the saccadic movement of the eye (fine movement) and a neurophysiological measure of perceptual differentiation were employed. No significant differences were found pre and post-Rolfing for the group as a whole with these measures. A number of biochemical measures were also recorded:

1. 17-Hydroxycorticosteroid (17-Hcs). Variations in secretion from the adrenal cortex of 17-Hcs (urinary) have been linked both to stimulus intensity modulation and to emotional stress, (Silverman, et.al., 1969; Henkin and Daly, 1968). In the present study, a sample of each subject's urine was collected at approximately the same hour of the day before structural integration sessions 1, 4, 7, 10 and ten days after 10. Consistent with our expectations, we found a trend for lower excretion of 17-Hcs after the Rolfing series. Low 17-Hcs has been found to be associated with increased sensitivity Also low 17-Hcs values usually are not found in individuals who are in high stress states unless they are medicated (e.g. Ellman and Blacker, 1969).

2. A number of enzymes whose activity is known to be increased during physical stress also were sampled. These included creatine phosphokinase (CPK), serum glutamic oxalacetic transaminase (SGOT), lactic dehydrogenase (LDH) and aldolase. Blood samples were obtained according to the same schedule as for the other processes. Only one of the enzyme levels changed significantly after the Rolfing sessions, for the group as a whole: this was an unexpected increase in the level of SGOT.

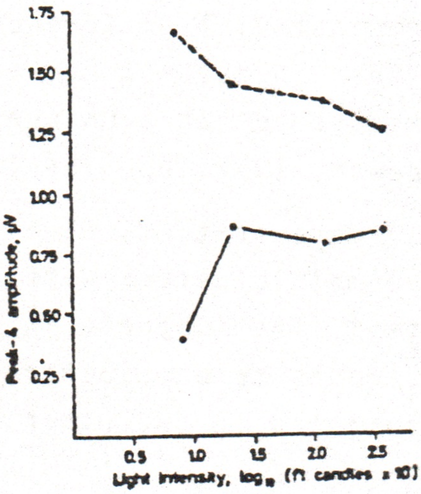


*Fig. 3.* Amplitudes of AER to four intensities of photic stimulation. Note: peak-4 designation is based upon numbering system of Kooi and Bagchi [1964]. Light values are in $\log_{10}$ (ft candles ×10) and range from 0.90 to 2.59. ●---● = Post S. I.; ●—● = Pre S. I.

Type (Of Body) Effects:

The data for each of the laboratory measures were analyzed statistically by the method of cluster analysis using all of the variables (except the amplitude measure which was inadvertently omitted). There are important advantages to cluster analysis that do not exist in ordinary single variable analysis. The principal advantage is that cluster analysis permits inferences regarding how individuals' response patterns differ from each other.

> "...differences between individuals are combinatorial, or as mathematicians say, combinatorial differences; one individual differs from all the others, not because he has unique endowments but because he has a unique combination of endowments (Medewar, 1957, pp. 154-155)".

Using a "nearest neighbor ISO-data statistical analysis" method (Ball and Ball, 1967), three main clusters were derived which contained all of the subjects.* The subjects in each cluster had similar performance patterns to each other and different performance patterns than subjects in the other clusters (see Table 1 for summary).

The subjects were then identified and their full body photographs were grouped into one of three principal categories--Type I, II, III. The photographs were then taken to Emmett Hutchins, an experienced structural integration practitioner. He was told nothing about the patterns of experimental results; he was simply shown groupings of full-body photographs (post S.I.) and was asked to describe any characteristics in their body organizations which distinguished between the groups. The following are Mr. Hutchins' verbatim descriptions:

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*A fourth cluster also was identified but it proved to be of another order. It is explained in subsequent paragraphs.

*Table 1* 4-cluster Iso-data analysis of subjects based on electrophysiological and biochemical variables

| Measure | Cluster 1 post-SI (n = 4) | Cluster 2 post-SI (n = 3) | Cluster 3 post-SI (n = 6) | Cluster 4[1] pre-SI (n = 10) |
|---|---|---|---|---|
| Aug./red. slope | most marked reduction | - | - | |
| Replicate index | lowest variability | - | highest variability | |
| Amplitude | | | | |
| Low intensity | - | - | - | |
| High intensity | lowest amplitude | | highest amplitude | |
| Saccadic rate | lowest saccadic rate | | | |
| CPK | lowest CPK (both pre and post) | highest CPK (both pre and post) | | |
| Aldolase | decrease | | slight increase | |
| 17-HCS | | highest 17-HCS (both pre and post) | | |
| SGOT | | highest SGOT (post) | | |

[1] Cluster 4 is an entirely pre-SI cluster. Of the three subjects missing from the pre-SI cluster, two were located in cluster 3 and one was located in cluster 2. These three subjects' pre-SI scores were not included in the post-SI summary presented here.

Hutchins' Body Types:

"(1) The greatest degree of balance between intrinsic and extrinsic muscles was achieved with the subjects in Group 1. These subjects can easily be recognized as those with the most change toward normal (optimal).

(2) Subjects in Group 2 belong to the soft-bodied type in which the intrinsic musculature is hypertense while the outer muscles are soft and toneless. Although the structural integration processing produced much improvement in this inner-outer balance, they still remain basically unchanged. It would be expected that these models will continue to improve for several months. Further Rolf work is indicated for this group.

(3) Group 3 is the reverse of Group 2. These subjects can be viewed as having a soft core structure and a hard outer sleeve structure. As in Group 2, much of the inner/outer imbalance still remains even after 10 hours of structural integration and further treatments are indicated.

(4) I am able to make observations on Group 4 (see Table 1) only by analysis of the three persons who are missing from this group. The three missing models show the least change in the area of the solar plexus, diaphragm, heart cavity, etc."*

These cluster descriptions were consistent with the patterns of results obtained with the biochemical and electrophysiological measures. Cluster #1, the group with bodies that Emmett Hutchins judged to have the greatest degree of balance between intrinsic and extrinsic muscles, was a laboratory prototype of an open, receptive, efficient sensory information processor. These individuals evidenced the most marked reduction slopes on the EEG evoked response procedure. They evidenced the lowest amplitude at the high intensity and the least variability on the EEG procedure. This pattern suggests efficient modulation without disrupting the sensory processing mechanism. They evidenced relatively low 17-Hcs, low CPK (a muscle enzyme which is elevated during certain stress conditions), and relatively low aldolase. They also evidenced the lowest SGOT levels (not shown in Table 1). Whereas EEG evoked amplitudes at lower intensities were not different from the other clusters. At the highest intensity, the amplitude response was the smallest of the three groups. Such a

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*This fourth cluster was made up of all subjects in the study, except three, and was a pre-SI cluster. The first cluster was a post-SI cluster and the other two also were essentially post-SI clusters.

pattern of response to low and high intensity stimulation is considered to be an adaptive one. It indicates both sensitivity to stimulation and a capacity to modulate (efficiently) strong stimulation (e.g. Epstein and Fenz, 1970). (Personality data, available on half of the subjects in the study also were in accord with this formulation).*

Two different patterns of biochemical and physiological variables distinguished clusters 2 and 3. Recall that Emmett Hutchins had characterized the individuals in cluster 2 as having hypertense intrinsic (core) musculature as contrasted with cluster 3 individuals whose musculature around the core were hypotense. Clearly, the unique patterns of biochemical characteristics evidenced by cluster 2 individuals was consistent with E.M.'s body structure image for this group: Thus cluster 2 individuals had the highest CPK levels both before and after Rolfing. Recall, CPK is a muscle enzyme which is elevated during stress. It appears to be directly linked to certain kinds of hypertense muscle tone (Silverman, et.al., 1973). High levels of SGOT which were highest in Group 2, also are associated with a state of high stress. Finally, 17-Hcs which is known to be elevated during organismic stress, also was found to be highest in cluster 2 both before and after Rolfing.

Cluster 3 individuals evidenced a quite different pattern of imbalance than cluster 2 people in their laboratory measurements. Whereas the cluster 2 pattern suggested a chronic stress adaptation (around a hypertense core musculature), the cluster 3 pattern suggested the locus of imbalance to be in neural trans-

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* It is important to note that the physical differentiations made by Emmett Hutchins were anything but obvious to a number of the scientists on the research team. Rather, these distinctions appeared to be the result of a specialized way of viewing the body that Structural Integration practitioners cultivate.

mission in the central nervous system. Thus cluster 3 subjects were found to evidence the highest degree of variability of responsiveness on the EEG evoked response procedure. Interestingly, evoked response amplitudes at the highest stimulus intensity also were higher in Group 3 than in the others. It was conjectured therefore that strong or otherwise unacceptable stimulation would be dealt with by cluster 3 individuals, not by reducing its experienced intensity, but rather by disorganizing it (making it more variable). Thus, structural instability in this cluster would be associated with deep-seated problems due to incomplete information processing and periodic emotional up-heaval.** Hypothesis: There is a problem for cluster 3 people in sensory information processing which occurs at the central nervous system level and which reinforces off-balancedness in the physical structure, despite Rolfing manipulation. Perhaps the electromyography (EMG) study of Valerie Hunt and her colleagues on these same subjects could shed some light on this premise. We waited for the completion of the analyses of the EMG study.

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** As used here, the term "deep-seated problems" (in under-standing) does not have anything to do with conventional intelligence. Rather it refers only to a tendency to obscure the meaning of things which elicit high excitation (for example, things which are emotionally "charged"). George Whatmore's analogy of the operation of a high-gain amplifier is a useful one here. Such an amplifier is capable of carrying out its intended function when the signal is low enough. However, the amplifier will begin to oscillate (the equivalent of disorganization) when subjected to a greater signal input, without "fatigue" of parts being present. "During the period of oscillation, the signal output no longer bears a relationship to the input signal (Whatmore, 1966, p.715)." Making sense in a stable coherent manner of what is coming in is precluded by the oscillation. When the signal is again low enough, coherence returns to the system.

The Electromyography Study:

An electromyograph (EMG) represents the activity of nerve impulses (or action potentials) in muscles. Advances in computer technology have made it possible to analyze quite complex patterns of muscle activity with this technique. The electromyograph is a wave-form recording of the summated electrical potentials of neurons in a particular muscle (or muscle group). In Valerie Hunt's study (Hunt and Massey, 1977) silver chloride surface electrodes were placed on several different muscle areas and simultaneous recordings were made of their electrical activity. Raw data myograms were compared before and after the Rolfing process. Additional computer analyses were carried out on the myograph wave-forms (amplitudes, power and frequencies). Analyses were also completed on differences in patterns of action potentials between differently located muscle groups (e.g. spinal muscles vs. arm or hip muscles). Recordings were made during rest, lying, and during such activities as walking, jogging, sitting, throwing, and lifting a stool. In this study, lying and throwing were chosen for analysis most frequently because these represent motor tasks requiring the least and most neuromuscular excitation.

General Effects:

Most of the analyses reported were based on electrode placement on the following muscles: scaleni (neck), anterior deltoid (arm), erector spinae (spine), and gluteus medius and minimus (hip).

Several significant findings were reported which suggested that following the Rolfing process there was "improved organization and greater balance in the neuromuscular system (Hunt & Massey, 1977, p.210)". For example: Statistically significant increases in EMG wave-form amplitudes in the spine and arm were found during five of six motor tasks. An increase in amplitude is important when it co-exists with a shorter duration of electrical activity in a muscle. This pattern did occur following S.I. during such moderately active tasks as jogging and lifting. "In these instances the resistances from inertia, gravity and friction were overcome more rapidly." Also the greater amplitude recorded from the spine during movement suggested improved reactivity of the deep muscles; these provide "stabilization for effective use of arms and legs in transmitting force to objects or to the body in locomotion (p.206)".

Power density spectra frequency analyses of the electromyographic outputs were completed for different activities, during rest, and for different muscle groups. Previous neurophysiological research has demonstrated the importance of distinguishing between low frequency and high frequency EMG activity. Various researchers had shown that motor neurons in both the brain--the "alpha" system--and those from the spinal cord--the "gamma" system--both contribute to muscle contraction. Further, other research had indicated that stabilizing muscles such as are found lying deep around joints in the trunk and spine normally emit a preponderance of low frequency electrical activity. Moving muscles, containing more kinetic motor units, emit more high frequency activity. Of the muscles sampled in this study, the spine and neck muscles met the criteria of stabilizing muscles and the arm and hip muscles met the criteria of moving muscles.

The analog data were frequency digitized from 0-250 $H_z$ and subsequently divided into a 0-40 $H_z$ low-frequency category and a 80-160 $H_z$ high-frequency category.

Frequency analyses of bioelectric activity have indicated important behavioral distinctions between low(0-40 $H_z$) and high (80-160 $H_z$) levels. Among well coordinated bodies such as those of athletes, low frequency activity increases during large movements and high frequency activity decreases during large muscle movement.

Following the Rolfing process, a statistically significant trend was found for the high frequency band to increase during lying (p. 207). Frequency analyses of lying and throwing also revealed significant post-Rolfing changes in the low frequency (0-40 $H_z$) subjects. These changes were indicative of greater neuromuscular relaxation during both throwing and lying.

Before the Rolfing processing, baseline bioelectric activity was at a moderate amplitude level. There was no apparent difference in electrical activity between resting and all motor tasks. After Rolfing, the baseline activity was higher during rest and during isometric contractions such as standing and sitting; it was lower in between the isometric contractions of walking, lifting, jogging and throwing. Since the baseline level is a measure of resting bioelectric activity, the lowered baseline in between isotonic contractions may be interpreted as neural inhibition in the alpha system. In accord with this, following Rolfing, the high-frequency band of 80-160 $H_z$ tended to be higher during lying and lower during throwing. (p. 204 and P. 207).

Hunt and Massey wrote of this pattern of findings: "Because such findings have not been reported before,any explanation is speculative. However, the perceptual changes reported from data collected from the same subjects following S.I. warrants consideration. Using EEG Averaged Evoked Response Stimulus Intensity Procedures, Silverman, et. al. found that all subjects evidenced increases in the amplitudes of the evoked response waveforms" and a significantly greater reduction in responsiveness to strong stimulation. "He interpreted these pre and post differences to indicate an increased sensitivity and receptivity to environmental stimulation (subjects had higher amplitudes post S.I.) and as selective inhibition when stimulus intensity increased beyond a certain point (subjects had a relatively lower amplitude at the higher intensity post S.I.)".

"The possible relationships between EEG evoked responses dealing with patterns of stimuli organization and those of EMG motor organizations are intriguing. One could hypothesize that with greater receptivity to stimuli, post S.I. (inferred from the EEG results), there would follow neuromuscular changes to facilitate response. All behavioral responses stem from muscular contractions instigated by the alpha motor system with high frequency motor unit depolarization...It should follow that higher frequency resting myograms and higher amplitude evoked responses would constitute a more sensitive, receptive and responsive environmental interaction.

"Following the same conceptual logic, inhibition resulting from increased stimuli discovered in post S.I. evoked responses should relate to diminished high frequencies found in the EMG baseline in between bouts of motor activity after S.I. Such an interface outlines a simple yet elegant prototype for behavior organization with improved integration of the motor response system interdependent upon increased organization of the sensory information processing system (p. 208)".

Another finding: "After S.I., an ideal pattern existed in throwing--an example of vigorous transference of force to an object." There was a statistically significant increase in the action of stabilizing muscles (neck and spine). Likewise the slight but insignificant decrease in the power exerted on the moving muscles (a decrease in the number of motor units activated) was in the improved direction. When more force is transferred to an object through better mechanical efficiency, less contraction is required.

"Equally important, during lying (rest), the frequency power of stabilizing (spine) and moving muscles (arm-hip) both decreased significantly after S.I.... It is notable that the greatest change occurred in the deep holding muscles of the spine and neck, those that commonly continue residual tension even in inactive states, contributing to nerve irritation and common muscular complaints.

"These two findings indicate that after S.I., subjects were at greatest rest during inactivity, and they increased their mechanical efficiency by improved stabilization and vigorous moving (p.208-209)".

Type (of body) effects:

Hunt and Massey also differentiated their subjects into three clusters derived from the Silverman et.al. study. A number of impressive differences between the groups emerged. For example, in analyzing activity in the low frequency spectra (0-40 $H_z$), statistically significant differences were found between all three clusters in spinal muscle activity. During lying (rest), all three groups differed significantly from each other pre S.I.; all three comparisons post S.I. also yielded significant differences. During throwing movements, Group I differed significantly from both Group 2 and 3 pre S.I.; post S.I. spinal muscle activity was different between Group 1 and Group 3. This pattern of changes paralleled the greater structural changes of Group 2 and the minimal structural changes of Group 3. Group 1 differed from Group 3 in all spinal muscle comparisons. In all, ten out of twelve comparisons yielded significant differences. In still other analyses, some additional trends were found: "Some of the most interesting evidence of this study lies in the frequency patterns of the cluster groups discovered by Silverman et.al. Inspection of the mean frequency scores of each cluster group during lying and throwing indicates changes which did not follow a linear trend but rather tended toward a norm (p.209)". For example, cluster 1 subjects evidenced a great amount of low frequency activity and relatively little high frequency. After Rolfing, there was a drop in low frequency activity and a slight increase in high frequency. Hunt's interpretation was that initially cluster 1 subjects were doing too much and that the S.I. process "lowered their gain so that energy utilization was simply at a lower level but in the same pattern. This pattern was a relatively balanced one to begin with."

Cluster 2 in contrast was initially highest in high frequency and had relatively little low frequency activity. Following S.I., there was a drop in high frequency and an increase in low frequency during movement.

Cluster 3 individuals did not change much. Post Rolfing high frequency was essentially unchanged but there was a slight increase in low frequency activity. In comparison with relatively marked changes in clusters 1 and 2, cluster 3 was minimally affected.

It is important to re-emphasize, when Hunt and Massey compared the ratio of low to high frequency activity for the subject group as a whole, they found no consistent pattern. When they looked at the data in terms of subgroups, patterns emerged--a low frequency cluster (#1) and two high frequency clusters (#2 and #3). For cluster 2 the high frequency activity was found to predominate in the upper part of the body. For cluster 3 subjects, high frequency was found to occur more in the lower part of the body. Recall, that low frequency activity is conceived to be associated with spinal action and high frequency activity with cerebrally-initiated activity. Whereas the high frequency alpha system is linked to motor initiation and motor inhibition, the low frequency gamma system is associated with movement energy and movement completion. The implications of these findings are in need of further clarification.

Conclusions From The Myography Study:

By reorganizing the deep musculature around the spine in relation to the other body segments, significant changes happen to a body. A lot of high frequency bioelectric activity recorded from the musculo-skeletal system, particularly during movement, indicates an imbalance in moving; it also represents excessive inhibition and disorganization by the physical structure in contacting the environment. Working on the core muscles in imbalanced bodies drops the amount of high frequency during motor activity. Obviously the implications of this research are important, not only for the structural integration method but for our understanding of bodily functioning in general.

To repeat, a lot of high frequency is a way of blocking effective energy mobilization through the musculature. It is an indication of imbalance in the musculo-skeletal system -- a failure to maintain balanced energy flow between the body and its environment. There were two types of high frequency clusters found. One occurred in a tight core high tension group. Rolfing changed these people somewhat. The ratio of high to low frequency activity was altered so that the low frequency was more in evidence after Rolfing.

In the other high frequency cluster, there was almost no change. In considering the relative lack of change in this group, Dr. Rolf said: "There isn't a fundamental support for that material structure... These people have no stability." When there's nothing substantial in the way of a core to go in and work on, the practitioner is in a difficult position to effect change. A revised approach is obviously necessary if body work is to be effective here.

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Any structure which is capable of equipoise balance has a center. This center is the balancing principle of the physical structure. As Dr. Rolf taught, the structure of the human body is envisioned best as "a something around a vertical line". This vertical line is the center of the body. At its simplest, the center line functions as the organizing line around which the various body segments balance and are balanced by each other. The center functions as a reference for the "member" musculo-skeletal units of the physical structure to relate to; it also is the location of the physiological structures of "head-quarters". That is, somatic structures at the center have co-ordinating and in- form- ative functions. The evolved somatic structures of the center are designated as the center-al nervous system (CNS). This system is a communication system; its medium is bioelectrical.

The research reviewed here suggests that when the musculo-skeletal structure is properly balanced, the central nervous (communication) system functions more efficiently. In turn, energy is utilized more economically by the musculo-skeletal system and receptivity and sensitivity to the environment are increased. Even in so-called normal individuals, when core physical structures are relatively undifferentiated, there is an identifiable lack of stability in sensory and motor information transmission. This, up to now elusive instability at the physical core, serves to maintain a subtle imbalance in neural transmission (and visa-versa) and therefore in over-all adaptation.

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