

Does Normal Function Integrate Structure?

If it is true that tension rather than pressure changes fascia, movement can be expected to change fascia, too. The conditions for such a change through movement are discussed as well as factors which would make this change integrative. Four models were photographed before and after doing Folding on one leg in a stretching mode with the intention of looking for indications of possible structural integration.

Function is movement¹. In order to better understand the relationship between function and structure, and vice versa, these two concepts have to be defined more exactly². The body with its shape, whether changing or not, is seen as being composed of a structural and a functional element. The first is given by "the structural body", the body with its individual form in which muscle activity is thought to be absent. Function and movement is then what muscles do with the structural body.

The functional element is represented by the tonus pattern of the musculature. This is the sum of all active muscle tension in the body at any given moment in time. Muscle tissue contributes active tension to the overall tensional pattern in the body. The passive tension component is partly the result of the influence of gravity and normal force (ground reaction force). It also depends on the individual shape and resilience of the fascial network. The pattern of active tension possesses a qualitative or geometrical aspect: where in the body are which muscles exerting how much tension at a given time. It also possesses a quantitative aspect: how much overall active tension there is in the body. Energy expenditure is proportional to the amount of active tension which should preferably be low if energy is to be conserved.

The overall amount of active tension can be broken down into two kinds³. The first kind, "base tension", is necessary physically. It serves to offset the passive gravitational and elastic forces where they disturb or inhibit a given posture or movement. The other kind, "excess tension", is unnecessary from the physical point of view. It produces additional tension in the body and necessitates still more active muscle tension to maintain balance and secure the form of a movement or posture. Bodies always operate with more or less excess tension, and never with simply that amount which physics would call for. Normal Function is not characterized primarily by a low degree of excess tension although this is desirable. It is defined by the minimum of base tension, i.e. active tension that cannot be reduced further because of the absolute limitations which physics imposes. The amount and the pattern of base tension depend on how the body is „arranged in space“, its exact configuration in the gravitational field, and on the state of the fascial network of a given body, i.e. its structure.

The relationship between function and structure is best examined separately in a long-term and a short-term view. Over long periods of time, from a minimum of a few days to months and years, the structure of a body changes slowly. At any moment in time, structure is

1) Rolf Ida: „Rolfing. The Integration of Human Structures“, Harper & Row, New York, s.a., p. 153

2) Notes on S.I. 89, p.36

3) Notes on S.I. 91, p.29

expressed by the "state of the fascial net", the main determinant of structure. Structure is the result of the life-long process of opposing tendencies in the fascial net. On one hand, fasciae permanently shorten and rigidify. The body shrinks constantly. But movement influences the fascial net in the opposite way: it stretches fasciae, lengthens them and makes them more resilient.

"Function determines structure" means that the structural body is constantly being shaped and reshaped by the way we habitually move. The fascial net adapts to the way the body is used. When postural or movement habits change, structure will also change, adapting slowly to a different use of the body. "Structure determines function" means that a given structure allows a certain set of movements and postures, while excluding all others. A body with shortened knee flexors cannot go into a stance with hyper-extended knees, for example. More specifically, the structure of a body determines the amount of energy that must be produced for a given form of movement or posture. A movement that closely follows the "bed" of the fascial net is economical. The further away from this bed it is, the more it goes against fascial resistance, which in turn requires more effort. Opposed to this is the point of view of Normal Function which uses passive tension of fascia in selected areas to replace active tension.

The short-term view comprises a time frame from seconds and minutes up to a few hours. During these short periods of time, structure usually doesn't change macroscopically and can be considered constant. The shortening tendency of the fascial net is not in evidence. Fascia doesn't shrink within seconds.

The opposing tendency in the direction of "length" or "freedom" is usually not in evidence either, except for extraordinary events of rapid structural change such as, for example, accidents or surgery. Some manual methods of bodywork probably also induce some degree of short-term structural change. And finally, expansive or intense movement produces structural change, probably more or less in proportion to how much stretching of fasciae is involved.

The relevant question arises: what happens materially with fascia when it changes, or when it is being changed? This question is of special interest as far as change toward "length" or "freedom" is concerned. Extreme examples, in the course of which the continuity of the fascial net is disturbed (as in surgical cutting or with injuries that rupture fascia or break bones) are disregarded here. The question pertains directly to the practice of integrating structure, because on the material level this involves freeing fascia, making it softer or longer. Turning to Ida Rolf for what she had to say on the subject is not particularly enlightening. She does not seem to have been very interested in it. We find essentially three ideas that she appears to have entertained.

The oldest one of these seems to be the idea of "gluing"⁴. According to it, the fasciae of adjoining muscles are glued together and restrict free gliding of the fasciae on each other. Separating the muscles by "ungluing" their fasciae would restore physiological function.

4) Rolf Ida, op. cit., P.35

The practices of Structural Integration and dissective anatomy give little reason to doubt that this idea is sometimes true. The liquid film between fasciae would dry out in certain places because of a mechanical irritation, as the result of a local or general inflammation. The remaining "sticky" collagen would glue the fasciae together. Perhaps the degree of this "glueing" would eventually become greater as collagen fibers are added and organized to create adhesions.

The "gluing" idea probably explains to some degree what happens when structure is changed, but it also presents serious problems. It defines as the place of structural disorder the space between fasciae, disregarding the state of the fasciae themselves. It implies that "ungluing" and removing all restrictions would produce structural integrity. This statement is certainly not true in a general sense because the fasciae, whether glued together or not, are adapted to the structure and determine it as it exists.

"Ungluing" fasciae, or "interfascial release", is certainly an element of the practice. It leads to more freedom and differentiation. This may help to integrate structure, but it may also lead to disintegration. Whether an intervention is integration or disintegration depends on the role such "gluings" play for the whole body. If their function is to help holding it up and prevent collapse, their removal must be expected to result in disintegration.

An internal structure with a strongly curved upper back and a flat chest might be taken to illustrate the point. Freeing the fascial layers in back can be expected to result in further bending of the back, and separating the layers in front would still leave them short and hard. These fasciae are obviously in need of lengthening rather than just "ungluing".

In practice, it is often tempting but also risky to focus on "interfascial release". The guiding concept of normal structure tends to quickly slip out of consciousness. And with the intention of "freeing" replacing that of integrating structure, disintegration becomes much more of a possibility. In fact, "interfascial" restrictions hardly deserve much interest because they seem to be dealt with almost automatically when one concentrates on integrating the body structurally. Differentiation appears as a by-product of integration, not as a prerequisite for it.

Ida Rolf's second idea was that pressure exerted on connective tissue might cause a gel-to-sol transformation in these tissues, which then might lead to a plastic change, with the tissue setting in its new form afterwards⁵. She surely was aware that this property of colloid solutions does not apply to fasciae but only to the ground substance. This second idea thus seems to be linked closely to the first one in that it attempts an explanation of what might be happening during "ungluing". It suffers from the same drawback, namely from defining as the place of change the "interfascial" space, leaving the fasciae themselves out of the picture. It also raises new questions by explicitly stipulating pressure as the agent of change. Pressure may play a role in "interfascial release", but it is also in direct contradiction to the third idea as well as to practical experience.

The third idea can be found in the caption of an illustration showing a sweater being pulled

5) Rolf Ida, op. cit., p.42

by a hook⁶: "If the displacement (of the strained elastic fabric) exceeds the elastic limits, an aberrant pattern remains". This observation is in accordance with mechanics. For the sake of clarity the statement could be extended in the following way: If the elastic limits are exceeded, "a plastic deformation takes place and an aberrant pattern remains". Tension of a certain magnitude thus induces an irreversible, plastic deformation in "ductile" materials. Collagen fibers and fascia, like all "woven tissue fabric", are certainly ductile.

The third explanation seems to conform better to practical experience than the first two. It is fairly obvious that only tension causes fascia to lengthen in an efficient and predictable way. Pressure, if applied with the intention of changing fascia and if its degree is high enough, may eventually create more length, too. But it generally results in what is experienced as "mashing", and since the result of such mashing is highly unpredictable, it must be assumed to often result in disintegration. The example of the sweater can be taken to illustrate that a huge amount of pressure would change its fabric and shape, but it would do so at the price of mashing it. To reshape a sweater that has gone out of shape and into an "aberrant pattern", it would be much more sensible to pull at the right places to bring it back into shape. Some degree of pressure would still be required to produce the friction necessary to apply traction and thus produce the necessary tension, but it would be considerably less. Similarly, in Rolfing, tension is applied to a certain layer of fascia in the appropriate direction. Thus, less force and time are required to plastically change the tissue, and the change can be monitored exactly as to its direction and degree.

In movement, fascia is tensed passively and stretched in various ways and to different degrees. With habitual movement, this seems not to be very marked. Neither the sensation in one's own body, nor the observation of someone else moving give the impression of fascia being stretched. Still, small amounts of tension in the fascial net probably serve to keep open the established "aisles" in the fascial net, effecting small plastic changes where tissue has shrunk superficially and most recently⁷. "Stretching" after having taken a nap would produce a little more of that kind of change. More vigorous stretching exercises would load fasciae with a considerable amount of passive tension, changing them plastically to a noticeable degree. The "burning and tearing" kind of pain associated with such exercise seems to be the same that occurs frequently when fasciae are stretched manually. This suggests that, in principle, manual change from outside and "internal" stretching through movement have the same effect on fasciae: softening and lengthening them (and also separating them by "ungluing").

Pain and discomfort signal that a change is happening in the body or that this change could pose a threat to the organism. This automatically triggers homeostatic self-regulation mechanisms, which serve to prevent change and safeguard the present state of the organism. In the case of the fascial net contracting muscles perform this protective function. It is not clear how exactly active muscle tension protects fascia from being changed, softened, or lengthened. In the practice of Rolfing it is obvious though that nothing can happen when muscles are contracted. If muscles contract the associated fasciae are not

6) Rolf Ida, op. Cit., p.39

7) Notes on S.I. 90, p. 31

accessible for being stretched effectively; they won't change. Change can only happen if muscle tonus is relatively low.

The situation is similar with movement. The more muscle activity is employed to produce a movement, the less the fascial net will be affected. Stretching will be helpful to a certain degree, but it seems obvious that a high amount of excess tension defeats the purpose. In addition, homeostatic mechanisms come into play automatically. They serve to counter the threat of change - no matter whether positive or negative - and to minimize in advance the pain that goes with stretching. This happens in two ways. First, muscles hold on just that crucial little bit that, if let go, would result in marked change. Secondly, the movements intended to stretch are often guided around the deepest and strongest restrictions, thus reducing stretching to a superficial phenomenon

Normal Function is the most economical way of moving. It requires the least amount of active tension, i.e. it is function with the lowest possible amount of base tension. This statement apparently contradicts the one made earlier, that movement which follows the "aisles" provided by one's individual fascial net is easiest. The earlier statement is valid with regard to random function, which is ubiquitous. In random movement, the alternatives to "easy function" are always produced by additional work by muscles to overcome fascial resistance. They are based on ideas of "good posture" which may then be extrapolated into the area of movement. Typical notions are: holding the back straight, waistline back, flat belly, chest out, head on top. The predominant aspect of random function is that the destructive effect of gravity is countered largely by muscle force. Standing straighter reduces the disturbing force of gravity, but it involves more effort because fascial resistance and resistance from excess muscle tension must be overcome actively.

Normal Function largely employs elastic forces provided by fascia to neutralize gravity's effect (in contrast to random function, which typically involves "easiest function" in the "aisles" of the fascial net). This is conditional upon minimal excess tension and on the clear and conscious knowledge of which kind of posture and movement makes best use of the supportive potential of the fascial net. As a consequence, passive tension in the fascial net is fairly high and fasciae are stretched, softened, and lengthened maximally by movement. Therefore, Normal Function can be expected to produce a certain degree of structural change.

But in Structural Integration it is not so much the degree of change that is of interest but the direction of change. And just as random manual intervention in the body must be assumed to produce disintegration, random movement does the same. If the focus is on range of motion and increasing flexibility, the body is almost certainly disintegrated. A structural as well as a physiological argument support this point.

First the structural argument. Rigidity in the fascial net is distributed unevenly. Using the image of the sweater, the fabric will be woven tighter in some areas than in others, where it may appear much looser. Pulling at the sweater indiscriminately will not result in the fabric becoming more even but rather in augmenting this imbalance. The loose areas will become looser and the rigid ones will stay rigid. More specifically, in the human body tissue in secondary shortness will generally give in and soften first while the more rigid areas in

primary shortness will not respond. Structure becomes more imbalanced instead of being more balanced. Or, on a more abstract level: The compensation for a disorganizing "cause" will disappear first, leaving the "cause" unchecked.

Now to the physiological point. It is precisely the conservative homeostatic mechanisms mentioned above that prevent integrative change. Their tendency is to minimize any kind of change. While they may not succeed with rigidity that is more superficial and accessible, they are more effective with rigidity that is "deeper". The body avoids movement that "really hurts", meaning movement which affects the deepest and toughest restrictions. A clear example of this is seen when teaching Folding on one leg. Even when they understand Folding and the principles of Normal Function perfectly, clients will invariably employ all three "means of evasion" without being aware of it:

1. The supporting leg is rotated externally,
2. The pelvis turns away in the direction of the free leg,
3. The free leg is abducted and rotated externally.

All three "tactical means of evasion" prevent fasciae from being fully loaded, reducing the degree of fascial support and of fascial change. But, more importantly, they take the body away from a more ordered arrangement into a functionally "aberrant" pattern, and therefore whatever structural change is happening will not be integrative. Conversely, if the functionally normal arrangement – in the sense of Normal Function - is kept and optimized, structural change will happen exactly in those parts of the fascial net that are responsible for structure not being normal. Change will then be structurally integrative. Coming back to Ida Rolf's image of the sweater: If the fabric of the sweater shows an aberrant pattern initially, pulling it in the direction of the normal pattern will not "leave an aberrant pattern" but a more normal one.

An acute awareness of the whole body moving in Normal Function is necessary for changing fascia in the direction of integration.

A Reality Check

Four clients were asked to do Folding on one leg in a stretching mode. Photographs were taken before, after Folding on the right leg, and after Folding on the left leg.

Taking Before and After photographs is befuddled by several issues. One of them is the fact that conditions for what could be called "easy stance" and "easy movement" are decisively different. For easy stance – and if this term is thought to include the notion of economy -, the body seeks an arrangement and balance which is close to what is called stable equilibrium in physics. Typically, people stand with the weight on their heels, an anterior hip-axis (the pelvis is shifted forward functionally), the trunk slightly slanted backwards on top of the legs, the knees hyperextended if structure permits it. This "usual stance" is fairly economical, but the main gain seems to be with the greatly reduced demands on the central nervous system. The brain constantly anticipates possible slight disturbances of balance,

comparing it with the sensory input which is much less in standing than in movement. The job is much easier when the degrees of freedom in the physical sense are minimized. Usual stance is “comfortable”.

In contrast to this, when moving the body seeks another kind of balance which is closer to labile or unstable equilibrium. This is very obvious when one asks a person standing to start to walk. There is first a subtle or not so subtle reshuffling of the body parts forward and back before that person actually starts walking.

Structural Integration is certainly not so much about better stance but more about moving better on the feet in the gravity field. Therefore, we asked the clients to stand normally, i.e. in the unstable equilibrium of Normal Stance, for picture taking. This is not easy but rather very demanding on the central nervous system. It also narrows down the range of functional variability of stance and could be expected to show more clearly structural changes. The criteria for Normal Stance are:

- the center of gravity is in front of the ideal point of support,
- the hip-axis is posterior to the Line,
- there is the minimal normal zigzag line,
- acmot.

Another issue, related to the functional problem mentioned above, is the fact that the body has to find a somewhat different and new kind of balance if structure has actually changed. One means of doing that is placing the feet somewhat differently. In order to restrict that we asked the clients to stand with the feet closed. This has an additional benefit: the body is somewhat longer in closed-feet stance. This produces more passive tension in the body stocking all the way up. And this would make it somewhat harder to obscure structural changes by functional adaptations.

A third issue in taking Before and After pictures in Rolfing is the obvious fact that during a session there is an enormous sensory input, information, which changes the tonus pattern massively. Often – but not always – there will be much less excess tension after a session just like after a good massage. People might look much better for such functional reasons regardless whether there was a structural change or not. Since in our case Folding on one leg was short – not more than one minute – we could expect that this effect was minimal.

It turned out that we were somewhat overoptimistic concerning these aspects. All the clients had been exposed to Rolfing and Normal Function to different degrees. Still, it proved impossible to maintain the nine criteria we had for Folding on one leg all the time, not even the four for Normal Stance. These nine criteria were:

- the four front-to-back criteria of Normal Stance,
- the three means of evasion,
- the additional criterion that the supporting leg and the ipsilateral half of the trunk should be medial convex (hip in, upper body out),
- that in Folding the folds should go forward and back as horizontal as possible.

Apparently, the first and most important question when looking at clients Before and After is still not resolved satisfactorily: what are structural changes and what are functional differences.



1: RI, III, low countercurve, con. 1-1 before, 1-2 after Folding on right leg. Right foot less lateralized. Less pelvic side-shift, side-tilt more marked, slight extension of midline in upper trunk, head off to right. 1-3 after Folding on left leg. Strain in knees reduced, less pelvic side-shift and side-tilt (left groin deeper and wider), further lengthening of midline in upper trunk, left shoulder more off posteriorly.



2: LI, rll, marked upper countercurve, low and posterior right shoulder. 2-1 before, 2-2 after Folding on right leg. Less standard rotation of right leg, lengthening through trunk, 2-3 after Folding on left leg. Length through hips and groins, trunk highr on legs, upper trunk and shoulder-girdle more balanced.



3: LI, rll+, con. 3-1 before, 3-2 after Folding on right leg. Left pelvic side-shift and side-tilt is lessened, longer trunk and straighter countercurve. 3-3 after Folding on left leg, left foot less lateralized, pelvic side-tilt lessened more, less standard rotation in chest, head less right-shifted.



4: RI, III, con legs, hips. 4-1 before, 4-2 after Folding on right leg, lengthening of right half of body, reduced standard rotation, 4-3 after Folding on left leg, widening and settling of left side of trunk, wider and deeper left groin, lengthening of upper countercurve (neck/head).