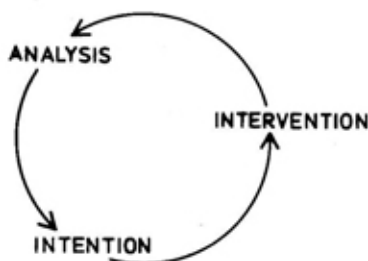


Willi Harder

## Seven Elements of Touch

There are probably good arguments for the view that “touch” is altogether impossible to describe. A frequent one takes the position that the quality of touch, whatever that may be, is wholly a matter of intuition and experience. But the predominance of touch in practice and because it is *the* medium through which professional knowledge in Structural Integration is transmitted, may make it worthwhile to take a closer look.

The process of integrating structure has been described by a cyclic model<sup>1</sup>. From analysis one gets to intention, then to intervention, and to analysis again.



A lot has been said and written about “analysis” and “intention” and rather little about “intervention”. The reason is quite obvious. “Intervention”, which deals with the actual touch, is pure practice and therefore much less accessible by a theoretical approach than “analysis” and “intention”, the first two parts of the cycle.

The practice shows a different picture. A naive ob-

server of a Rolfing session would see some analysis happen, suspect a certain amount of intention, but would witness mostly interventions of all sorts, the third part of the cycle. In the reality of the actual work the hierarchy is reversed: Touching the client is the preeminent aspect of the three.

This description of seven elements of touch is based on two contentions. The first concerns the relationship between knowledge and intuition on a general level. Knowledge is usually considered a necessary precondition for practicing a profession. But at the same time knowledge is – in a professional context at least – also a necessary precondition for intuition.

A vocational profession can be taken as an analogy. In calling a plumber to straighten out a problem with the sanitary system, the client expects it to be done in a professional way. One plumber will do it a bit slow, seeming to lack intuition, another will fix it in a quick, efficient and elegant manner. He might even come up with a better solution than in the initial arrangement. But in any case, the system will only work again, without leaking seals for instance, if the plumber is a professional who has the basic knowledge of the craft. And that is mostly the foremost concern of the client.

In a similar way, if there is a claim for professionalism, a Rolfer should be competent in the basic elements of the craft, not only as a secure foundation for intuition and higher aspirations, but also in respect of the client’s trust. The question then is if touch has a basis of knowledge which would make it such an element.

This leads to the second contention, that there actu-

1 Notes on S.I. 89/1, p. 43

ally are identifiable basic elements of touch, which not only can be learned and taught, but whose consideration is indispensable for the transfer of the theory into the practice.

Seven elements or aspects of touch are presented here in the context of Structural Integration to substantiate this second contention. The aim is to show how they relate to the other elements of the cycle: analysis and intention. To avoid misunderstandings: It is not about different types of touch, but about seven considerations which should go into one single touch.

"Touch" can mean and implies a lot of things, particularly if it concerns human beings. No matter what the intention of a given touch is, touching a client always goes beyond that intended level. Technically, intention in Structural Integration concerns primarily the fascial net, but the whole person must be respected in the touch. The measure and the essential basis of respect in the relationship with the client is the professionalism of the practitioner.

## 1. Surface and Depth

A not infrequent question in the Rolfing training is "How many layers of fascia are there in a human body?" While the answers vary, it is mostly quite unclear how one can identify these layers and then what course of action to take.

Ida Rolf has defined layers of fascia: "In the myofascial system as a whole, each muscle, each visceral organ, is encased in its own fascial wrapping. These wrappings in turn form part of a ubiquitous web that supports as well as enwraps, connects as well separates, all functional units of the body. Finally, these elastic, sturdy sheets also form a superficial wrapping serving as container and restraining support for the whole body - this is the so-called superficial fascia, lying just under the skin."<sup>2</sup>

Fascia forms a layer where it separates two discrete units or elements of the body, giving them the functionally required degree of freedom for mutual movements. This can be between the liver and the right kidney or between the m. biceps femoris and the m. semitendinosus. The problem then is to actually identify a desired layer.

A cylindrical glass-jar with a tin lid can serve as a model. There are three things which can happen when someone tries to open such a well closed lid. If the grip is too weak the fingers will just slip on the metal. Too much force presses the deformable metal against the more rigid glass of the jar and thereby increases the friction at the interface tin/glass where the two elements touch: The lid won't open. Only when the pressure is just right, the fingers will neither slip on the tin top nor press and fix it against the glass-jar: The two layers will move against each other, the lid opens.

This effect can be clearly felt at places where a bone is close to the surface, e.g. on the calcaneus or on the anterior side of the tibia. Too much force will press and fix the tissue firmly against the bone - and it hurts a lot! - too little results in slipping on the skin.

Another illustration of the same point is the idea of fascial layers as layers of stockings. A practical experiment is the easiest way to sense this. Have a person lie supine on the table with the legs stretched out and hold one lower leg with the tips of the fingers of both hands. The intention is to pull off a "stocking" towards the ankle. Too little pressure will result in slipping on the skin, the "top-stockings". Too much of it squeezes everything against the fillings of the deeper compartements and eventually against the bones. In between there is a continuity along which various depths of layers can be affected and caused to move against each other. Sensing the relative motion between fascial wrappings at the intended level ensures that the pressure is just right for all levels of intervention: Lengthening, freeing, organizing and integrating<sup>3</sup>.

A further experiment shows that several layers at various depths can slide simultaneously. Imagine the cross-section of a thigh with the various compartements of the quadriceps femoris, adductor-group, hamstrings and iliotibial-tract around the femur. By holding the entire thigh in both hands with just the right pressure it is possible to turn the whole tissue-wrapping internal or external. The fascial layers slide against each other without taking the bone along. In the supine position, the patella can be used as a bony indicator which should not move at all.

It is not the absolute force or the magnitude of pressure which makes the effect of an intervention, but the right amount of it. Too little results in slipping on the skin or on a superficial layer above, too much in pressing the tissue against the next lower layer and blocking the movement.

## 2. Pull and Push

In the practice of Structural Integration each intervention produces a pull or a push in the direction of the long axis of a segment or the whole of the body. A practical experiment will show the implications and thereby the relevance of taking this effect into consideration.

Put one hand against the left or the right heel of a person lying prone on the table and give the leg a slight axial push in the cranial direction.

The response of the body on the side of the push can clearly be seen: the joints of the ankle, the knee and the hip are jammed, the lumbar and the thorax are compressed, the neck is shortened, the whole longitudinal axis bends, going convex on the opposite side to the push. The situation worsens with the increase of the push. Any other intervention on the foot or the leg which induces some degree of pressure in the cranial direction has the same effect.

A slight pull on the heel instead of a push has the opposite effect. The intervention affects and goes through the whole body as before, but disengages, opens and lengthens the joints and segments on this side. But an increase in the degree of the pull leads to additional and adverse effects. As the upper body is drawn caudally it

2 Rolfing, *The Integration of Human Structures*, 1977, p. 38

3 Notes on S.I. 89/1, p. 42-43

becomes concave on the side of the pull. The result is a shortening of the segments and a jamming of the joints on the other side. Furthermore, the client on the table begins to feel uncomfortable because she is losing the sense of security of the support of the table. And long before the body starts to slide and the client is pulled off the table, the nervous system starts to contract muscles in the fight against slipping. This functional reaction is undesirable as it masks the fascial net which is the level of intention in Structural Integration.

An analysis of four aspects of pull and push will corroborate a principle suggested by the experiment: that touch in Structural Integration should always involve a slight pull away from the center of the body.

a) The fascial net, forming the bags of the complex hydrostatic balloon of the body, transmits only tensile stress, whereas the fillings take all the pressure. Pushing towards the center of the body causes mostly a compression of the fillings and reduces the passive tension in the fascial net. But fascia, similar to a sheet of plastic-foil, can only be engaged, and be brought towards changing plastically, if it is tensed to some degree.

b) The difference between a slight pull and a slight push might be small quantitatively. But foremost it is the quality, the direction of the force, and not the quantity, the amount of the force, which matters in Structural Integration. Patterns of primary and secondary shortness in the fascial net develop in response to the gravitational influence on structural deviations in the body. The force of a push, no matter how little, towards the center of the body has the same effect as the force of gravity. They both reinforce existing structural deviations.

An appropriate pull however lengthens the midline of the involved elements of the body and allows to take them tendentially away from the structural aberrations towards normal. Furthermore with the fascial net as a continuous system through the body, a slight pull has the effect of involving the whole of it and respects its connecting function.

c) In normal breathing the trunk has to be allowed to lengthen and widen in all directions<sup>4</sup>. Pushing any part of the body towards its center prevents the necessary axial extension or, if for example the arm is pushed, the radial extension of the trunk for inspiration.

d) The expression "slight" has been used to describe the quantity of the correct pull. But what is "slight" and where does the pull go beyond the limit of "slight" and becomes "too much"? An obvious indicator for the limit is the appearance of adverse geometrical changes on the other side, like the ones described in the experiment, which can be noticed just by looking at the body.

Sensing the interaction between the body-weight and the support from the table is a second, more subtle indicator for the point where unfavourable reactions to the pull start to appear in the body. "Subtle" must not

necessarily mean difficult. Understanding and being aware of the physical forces involved help to develop the sense for the limit between "slight" and "too much".

In physics, the first law of motion states that a body stays at rest if no forces act on it or if the forces which do act on it cancel each other out. The latter is the case with a body lying still on the table. The gravity-induced weight of the body is exactly counteracted by the support force of the mattress. And this is still the case when a further force appears which results from working on the body. Two components of this additional force have to be considered. The vertical component of pressure by touching is cancelled out by the support force from the table which increases in proportion. The horizontal component of the pressure induces friction between the skin and the surface of the table. The frictional force on the skin is, as long as the body stays at rest, cancelled out by the frictional force on the table, which is equal in magnitude but of opposite direction. The amount of the frictional force which resists the displacement of the body relative to the table is a function of a frictional coefficient times the weight of the body plus any additional vertical forces. The frictional coefficient is a measure for how well or how badly the materials involved, here the skin and the surface of the table, slide against each other. It has a distinct limit where a pull or a push gets large enough to start moving the body on the table.

But clients react well before this limit is reached by contracting muscles in a fight for horizontal stability. The level of the threshold is an individual combination of physiological reflexes and behavioural patterns. Besides the visual observation of the body-reactions, this threshold gives another indication that the upper limit of "slight" in the axial pulling component of a touch is being reached. But its approach can be sensed well before the muscular contraction sets in. It is difficult however to describe what exactly should be sensed in regard to the upper limit of "slight". The best way is to try it out practically as shown in the experiment, combining the visual control of the whole body with a mental awareness of the physical forces involved.

The stipulated requirement, that there should always be a net pull away from the center of the body, has practical consequences. It very often makes it mandatory to work with both hands. The pressure of one hand has to be checked by the other in such a way that the controlling hand pulls away a fraction more than the "working hand" pushes towards the center. In a move away from the center the situation is reversed. In order to prevent the pull from the "working hand", e.g. on the arm or the leg of a client, to increase beyond "slight" and evoke a contraction of muscles or a sliding of the body, the controlling hand has to hold back proximally towards the center, although a little less strongly, in order to produce a slight net pull.

### 3. Force and Weight

Two questions need to be addressed: "What does force have to do with touch?" and "What does weight have to

<sup>4</sup> Notes on S.I. 89/1, Elements of a Structural Theory of Breathing

do with force?". The answer to both questions requires a definition of the term "force".

The term is used with some ambiguity in the practice of Structural Integration. The range of structural intervention goes from powerful moves, where the involvement of force in the colloquial sense is obvious, to slight touches with subtle intentions for which the expression "force" seems inappropriate. The term "weight" appears sometimes during training, when a practitioner is advised to use his own weight instead of so much force during an intervention.

The term "force", as it is used in the physical sense, is free of ambiguity<sup>5</sup>. It is a highly abstract concept and a powerful tool to explain a large number of phenomena. The range goes from helping to explain why a person gets tired from carrying a shopping bag, to providing answers in connection with the expansion of the universe. "Force" is an "explanatory principle", which means that there is no direct answer to the question "what is a force?". In the context of mechanics, which is relevant for Structural Integration, "force" is understood sufficiently by regarding Newton's three Laws of Motion. In simple terms they can be formulated as follows:

- A force is something which accelerates something. (2nd Law of Motion)
- If a force is applied and the thing doesn't move, then there must exist a counter force of equal magnitude and opposite direction. (3rd Law of Motion)
- If a thing doesn't move, this does not necessarily mean that there are no forces present. It could also be because they cancel each other out. (1st Law of Motion)

The use of the term "force" in physics distinguishes it from the colloquial use. Physically, "force" can mean anything between the force of a soft feather touching the skin to the forces involved in heavy-weight boxing. A touch, however slight, always exerts a force on the body. It accelerates or causes a reaction in the physical sense. This answers the first question "What does force have to do with touch?": A touch is, among other things, always a force.

The concept of gravity is required to answer the second question: what does weight have to do with force? Physically, there is no difference between the two, because weight is a special type of force. "Weight" is just another expression for the force with which the gravity-field of the earth accelerates, or tries to accelerate, a thing such as a "body", towards the center of the earth. The effect of this can be seen on the bathroom-scale. Imagine a person standing on it and reading her weight. A slight pressure downward on her shoulders by a friend will increase the reading. The scale doesn't know the difference between the weight of the person and the force of the external pressure. Physically they are both the same: Forces which the scale has added together.

Having established that touch and weight are forces now allows an analysis of how the two types of forces

interact when a body is touched. Ill. 1 depicts in a simple model of how forces act on a body which is assumed to stay at rest on a table. The arrows symbolize the forces involved resulting from weight and touch. As vectors they possess a direction and a magnitude, the latter being indicated by the length of the arrows.

The illustration shows that when a solid body is touched, new forces appear, or those already acting on it change their arrangement to establish a new equilibrium. The new forces, as well as the changes, affect the internal state of a body and lead to "deformations". Inanimate material objects basically react internally to forces in two ways, if breaking is excluded: first by an elastic, reversible deformation, and then, in a second phase, with a force sufficiently increased, by a plastic, irreversible deformation of their shape.

The relative degree by which a body changes elastically and plastically depends on the inherent properties of the material and varies greatly<sup>6</sup>. The deformation of an object made out of foam-rubber exemplifies a pure elastic behaviour. After the release of an external pressure it returns back elastically to its original form. A lump of clay in contrast shows a pure plastic behaviour. It changes its form under a force and stays that way after the force has been released<sup>7</sup>.

Elastic and plastic changes of form are passive responses to external forces. Human beings however have an important additional alternative: they can change their form actively by a change of their tonus pattern. In the case of a disturbance of their balanced state by a touch which displaces their support point away from center, they usually react and adjust through a contraction of muscles<sup>8</sup>.

Muscular contractions as reactions to touch are unfavourable because they obfuscate what is the medium of the intended intervention: the fascial net. This becomes generally better available in the opposite case, when by a relaxation of muscles fasciae are tensed passively.

This physiological reaction to changes of the physical state of the body must not be confused with a more basic tactile phenomenon: the direct physiological response of either a contraction or a relaxation of muscles to touch in general.

The first of the two following experiments shows, based on the considerations of the model presented above, how a human body responds to the change of forces through touch. The second experiment concerns the direct responses to touch. It makes use of the weight of the body to sense the difference between a slight contraction and a slight relaxation of muscles. For the practical work it is advantageous to combine the mental awareness of the physical state of a body with a tactile sense of its physiological reactions.

6 cf. "Physics for Rolfers", Notes on S.I. 89/1, p. 13-14

7 It is a basic premise of the field of Structural Integration that the weight of a body, like any other force, also affects its internal state. Stranded whales mostly die because of their own weight.

8 cf. "Normal Function", Notes on S.I. 91/1, p. 12-13

5 cf. "Physics for Rolfers", Notes on S.I. 89/1

### a) *The Table as a Third Hand*

The intention of this first experiment is to demonstrate the difference between the two possible physiological responses to a touch, an active contraction or an active relaxation of muscles, and to relate them to the physical as well as to the physiological state of a person. The setting is a person lying on her side on a table, with hip- and knee joints in moderate flexion.

To sense the "contraction response" ask her to actively tense all the muscles of the thorax. Then as you push down vertically on the side of the thorax you should be able to feel the resistance against the touch and against the table, with the table "pushing back" from the other side of the thorax. The pressure from the table increases the contraction on the supported side of the body.

To sense the "relaxation response" you now ask the person to completely relax all the muscles of the thorax and to feel how her weight is supported broadly from below as she lets it sink slightly into the table. Like a balloon loosing air, the thorax becomes wider and flatter when muscles relax. This permits you to feel "through" the body and sense how its weight and the additional pressure from your hands is counterbalanced from below by the third hand: the table. The lower side elongates first, before the upper side, which is worked on by the hands, gets longer. The conscious sense of support from the table gives the person a feeling of security, which is

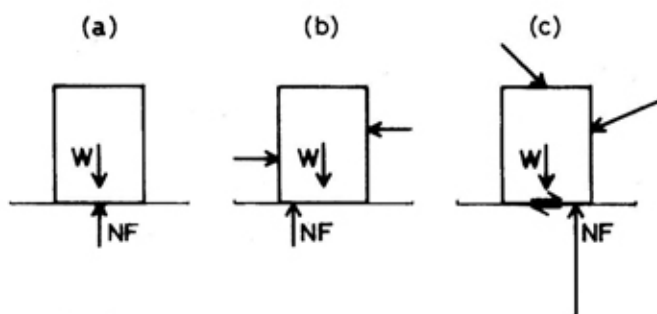
not diminished but enhanced by the pressure of the touch, and lets her relax even further. The fascial net becomes accessible.

The next intervention shows the response of a person when balance is disturbed. Press again down on the thorax with both hands, but this time slightly sideways. This moves the point of support away from center to the other side and soon induces the nervous system to contract muscles in the attempt to secure the stability of the body's position (Ill.1 (c)).

For most persons the main physical precondition for being able to relax muscles is the sense of a secure support for their own weight, be it from the table, the bench or the ground. One also has to have a very clear feeling of the interaction between the external force resulting from an the intervention, the touch, and the supporting counterforce of the opposite side.

The second aspect concerns the shift away from center of the point of support produced by the oblique component of the touch. The nervous system tolerates such displacements only if they are small compared to the whole support area. The core-principle as it is defined in physics may explain this phenomenon. For a cylindrical structure with a given radius standing upright, the core is a round area in the center with a radius of one fourth of this radius. When, as a reaction to an external force the point of support moves away in any direction beyond the core area, which is only one sixteenth of the whole support area, the opposite edge loses contact with the ground and the structure starts to tilt unless it is secured otherwise. A living person has the option to prevent the tilting over by an adaption of its tonus pattern, usually in the form of contracting muscles.

Ill.1: When a body is not touched (a), the only forces present are the weight and the Normal Force as the reaction to it from the table. When the hands touch the body from opposite sides horizontally but slightly offset (b) they do not cancel each other out completely. A rotational force appears which would cause the body to rotate around an axis if it were suspended in the air. But as it lies on the table, the rotation is prevented by a movement of the support point away from center to the left. Finally, if the hands touch the body at oblique angles, further complications arise (c). Equilibrium is produced through a movement of the support point to the right and a certain amount of friction between the body and the table.



### b) *Weight against Touch*

The difference between a slight relaxation and a slight contraction of muscles is not always easy to perceive with the hands. Using the weight of a person's body and letting it react against a touch is the best way to sense this qualitative difference.

A rubber-balloon filled with water can serve as a model to provide a mental picture of the interaction between muscle tension, fascia, and the "touching hand". The pressure of the water inside, "the filling", and the tension in the rubber-balloon, "the bag", hold the system in equilibrium. With this model lying on the table, imagine that you hold one hand underneath it and press upwards with one or several fingers. The effect on the internal state of the system "bag-and-filling" is a dent in the bag where your fingers press against it. The pressure inside the balloon and the tension in the wall both rise. In the larger view the interacting forces include the weight of the balloon and the pressure of the fingers. At the exact moment when the rising pressure of the fingers pushing up is equivalent to the weight of the balloon pressing down, the system starts to rise upwards. The extent of the balloon's deformation depends on the elasticity of the bag, the consistency of the filling and the initial tension/pressure state of the system.

Translated to human anatomy, the rubber-bag repre-

sents the fascial wrapping around a muscle or the whole body, the water as the filling the muscle-tissue inside. The rubber-bag with its elastic and plastic properties is a good analogy for fascia in the way it responds to touch. In the case of the water the analogy has to be differentiated. Muscle-tissue reacts similar to water if it is thought of as "thick water" except that it always in addition reacts to touch by relaxing or by contracting. This changes the consistency of the muscle-tissue to "soft thick water" in relaxation and to "rigid thick water" in contraction. In its neutral behaviour water marks the exact middle between the two possible forms of reacting. Relaxation is the desired response if the intention is on the fascial net, because, in analogy to the balloon-model, it increases the fascia's capacity for deformation.

For the experiment let a person lie supine on the table. Reach with one hand under one thigh and slowly let the fingers slide into the tissue upwards towards the femur. The leg should not be allowed to rotate externally. The only force which counterbalances the upward pressure of the fingers is the weight of the thigh, acting downward. If muscles relax, the patella remains steady and shows that the force of the touch is smaller than the weight of the thigh. The reduction of the pressure inside the "bag" of the thigh allows the fingers to slide deep into the tissue, often all the way to the bone. The relaxation not only allows the thigh to lengthen passively, it also leaves the whole leg supported optimally. One clearly senses the weight of the whole leg against the fingers and not just the small area which they touch.

If the patella moves up as the fingers move into the thigh, this indicates that muscles have contracted against the touch and that the weight of the thigh is pushed upwards. The muscle-tissue builds up internal pressure which prevents the external fascia around it from softening. The thigh has reacted by going into a state of rigidity and is no longer a "balloon". It is accelerated upwards instead of elastically deformed by the force of the touch.

The same experiment can be done with the person in the same position and with one hand under the middle back below the scapula and slightly to the side of the spine. A relaxation of the muscles allows the fingers to move ventrally into the melting tissue of the widening back. The anterior wall of the thorax, as an indicator, should not move upwards but lengthen in response to the reduction of the tonus of the trunk. As with the thigh, the improved support from below permits the nervous system to let go even further.

In both variations of this experiment it is important that the hand and the lower arm of the practitioner remain fully supported by the table. This allows the fingers to soften and to go through the "fillings" to the deeper layers of the fascial net.

The role of support as the precondition for muscular relaxation makes it important to consider not only the weight of a body but also the improvement or the disturbance of its balanced state through the force of touch. A tactile awareness helps to sense adverse responses to an intervention.

## 4. Structure and the Form of Parts

Wolf Wagner has demonstrated how deceptive it is to look at the outer form of a body if what we are really looking for is structure or structural changes<sup>9</sup>. When attempting to understand the structure of a body, the question arises of how we can draw rational conclusions concerning structure by assessing its visible form. Quite obviously there are visible differences between different bodies. They can be very marked when we compare the form of parts like feet, knees, pelvis, thorax or neck of two persons. But what is the difference between form and structure and what is the relationship? The parts, with their form and their relationship to the overall structure have to be considered, because when we touch a body in the practical work on the table, with structure in mind, it is always a particular part which we have directly in our hands

### 4.1 Levels of Abstractions

For methodological reasons it is useful to first look at and define the difference between form and structure. The view-point of Structural Integration is the whole body in gravity. It looks at the body in terms of forces acting on it and determining not only its overall form but also the form of its parts. In the block-model, structure would be a description of the relationship between the parts, e.g. between the thoracic and the pelvic segment.

Another essential distinction must be regarded, that between structure and function. Structure defines and describes a relationship of the parts which remains constant over a certain length of time, whereas function means the change of form of the body from one instance to the next.

The term "form" as it is used here has to be seen in the context of structure and not in the sense of how it is changed by function. The difference between the structure of the body and the form of individual parts is then a difference in levels. "Structure" is more on the abstract, "form" more towards the concrete end of the scale<sup>10</sup>. As the practical work mostly happens on the local level of parts we have to deal with their form. But we must always go up and down these levels, the whole as the relationship of the parts has to be kept in mind when we occupy ourselves with a part and its form.

### 4.2 The Assessment of the Form of Parts

Structure and form can both be described as bipolar deviations from the norm. The norm is the "zero-point" or "neutral" on a scale which extends in two opposite directions.

For the description of structure, which includes the consideration of weight, we use the three axes of space

9 "How can we know what works?" in Notes on S.I., 87/1

10 The next lower, even more concrete level would regard anatomical elements like the talus, the tibia and the m. tibialis anterior. "Form" would then be a description of how these elements relate to each other spatially.

Bipolarities	Examples
too low – too high	medial arch of foot
too narrow – too wide	malleoli, hamstrings
flexed – hyperextended	knee
too steep – too horizontal	ribs
too flat – too deep	thorax
too curved – too straight	spine
too long – too short	feet, neck
too oval – too round	thighs, thorax

Table 1: Examples of qualitative distinctions for the assessment of form:

plus the three incidental axes of rotation. The block-model as an example depends entirely on these axes. This allows both a qualitative description in terms of “either/or”, which defines the direction of a deviation from “neutral”, and a quantitative assessment in terms of “more/less”.

An example for this is the description of the form of the knee in the transverse plane. The structural norm is a straight midline through the whole leg with an angle of 180° between the thigh and the lower leg. The middle of hip-, knee-, and ankle-joint are on one vertical line.

In reality the angle always deviates from 180°. A knee is either varus or valgus, and it is different, at least quantitatively, on the two sides. The angle on the inside between the midline of thigh and lower leg is less than 180° for a varus knee and more than 180° for a valgus knee. The qualitative divider is the idealized norm, the coincidence of leg-axis and the line of the gravitational force.

This bipolar system which is used to describe structure can also be used to describe the form of parts of the body. We take the same given norm (“normal”) to describe the direction of a deviation and its degree. As in structure, the qualitative aspect is primary, the quantitative secondary. But even on the more concrete level of looking at parts, which can change their form much less functionally than the whole body, it is often necessary to differentiate between structure and function. Somebody with structurally slight valgus knees is able to hold them functionally in a varus or in an increased valgus position.

The list with the examples for bipolar distinctions has to be taken as a first suggestion. It is not complete and the structural relevance of the terms used needs to be clearly described and defined. The presented bipolar system for the assessment of form is an open field for further research.

#### 4.3 Form and Structural Dynamics

Structural Dynamics describes the dynamic state of a segment, or of a smaller part like the ankles, along the longitudinal axis of the body<sup>11</sup>. Collapse and overcompensation as expressions of this dynamic status are related to the visible outer form of a part of the body.

An example is given by the ankle-joint. The distal end of the lower leg, which consists mainly of the two bones tibia and fibula, are wedge-like supported by the talus. The malleoli as indicators are either too wide apart or too close together if we look at the situation in the transverse plane. In most cases we can decide which it is even if the “zero-point” can’t be exactly determined.

On the collapsed side, the malleoli are too wide because they have given in to the weight from above and collapsed over the talus which drives them apart. On the overcompensated side they are too narrowly bound together and sit too high on the talus. The assessment of the form allows here to draw direct conclusions regarding structure. On this level the picture is determined by the reaction of the fascial net to Gravity and Normal Force in conjunction with the local anatomical particularities.

The interaction of the relevant factors can be analysed in the same way at other crucial points along the longitudinal axis of the body. The form always gives important clues which indicate whether a certain structural element has given in or overreacted to the forces from above (Gravity) and below (Normal Force).

#### 4.4 Practical Aspects in Touch

It is not always easy to decide how the form of a part of the body deviates from normal and how it should change to go towards normal. But the parts always do deviate in one way or the other, the problem can’t be evaded by being unconscious about it. The conditional relationship between structure and form – changing a structure involves a change of form as well – make such decisions unavoidable. On the other hand, it is not all that difficult once one starts looking consciously. Firstly, the form-deviations are often quite obvious and secondly, the methodology of looking at them in terms of “either/or” allows in most other cases to come to unambiguous conclusions.

The following three examples illustrate how considerations of form are applied in the practice of touch. It is important however to note that the form of a part can never be looked at in isolation, it has to be considered simultaneously on the local level, in relationship to the adjacent parts or segments, and in the context of the whole body.

- In working on the thorax, regardless of the degree of integration and with the client lying in any position, one has to stay aware of whether its form is too oval or too round, too flat or too deep, whether the ribs are too steep or too horizontal, the costal angle too small or too big, the thoracic kyphosis too curved or too flat, and so forth. It is always the “either/or” decision which has the most direct influence on the direction of any intervention. Furthermore, any of the above polarities has to be seen in the context of the structural type of the client.
- For the hamstrings, possible form-polarities on the lowest local level include: too wide/too narrow, too lateral/too medial. It is also possible that they are, for

11 cf. Notes on SI 89/1, p. 31–34

example, too narrow at the ischial tuberosities and too wide just above the knee. The context of such deviations has to be considered at the same time. On the next level it is the form of the whole thigh: is it too round or too oval? On a still higher level, the rotation of the thigh around the longitudinal axis and a possible adduction or abduction in respect to the pelvis have to be kept in mind.

- A whole number of form-aspects have to be considered for any intervention on the foot. Is each of the three arches too low or too high, is the foot too narrow or too wide, too long or too short, is the sagittal midline lateral or medial convex away from normal?

Sometimes there are conflicts between different levels of integration. An example is the instance of an already too high arch on the shorter leg. Letting down the arch could bring the form of the foot closer to normal and disintegrate the overall structure at the same time.

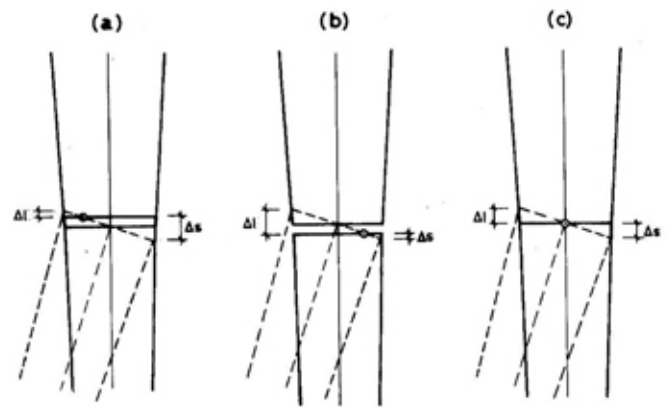
## 5. Extension Mode

Touch is often combined with movements. Either the practitioner moves a body segment passively or the client is asked to do an active movement as part of an intervention. The concept of the extension mode in Normal Function<sup>12</sup> is a crucial consideration for passive and active movements in the work on the table, on the bench or in standing. Normal Function defines how a movement has to be performed in order to be congruent with the ultimate goal of Structural Integration, the economy, or ease of function. It supports and maximizes the effect of integrative interventions.

### 5.1 Passive Movements

Touching or holding any part of the body in the course of an intervention will always by itself change the relationship of that part to the adjoining parts, either toward or further away from normal in the structural sense. In Structural Integration the intention and the effect should of course always be to hold whatever is touched toward normal. The relevant criteria can be explained well on the example of X-legs.

An X-leg has the center of the knee-joint medial to the straight line through the centers of the hip-joint and the ankle. Holding the knee towards normal means in this case obviously towards lateral, bringing the midlines of the lower leg and of the thigh closer to a straight line. But this geometrical aspect is not enough to make the touch structurally integrative. Structurally, the medial deviation of the knee has to be seen in the context of shortness, as a reaction of the body to forces. The fascial net holds the knee in its deviated position against the weight from above and prevents it from going further medial. In terms of forces, the fascia on the lateral side is in adaptive primary shortness, on the medial side in tensional secondary shortness. This fascial holding-pattern shortens



- III.2: The illustration shows a right leg from the front. For reasons of graphical clarity the thigh is drawn vertical and only the lower leg is thought to be moved from the dotted drawn deviated position towards a straight alignment with the thigh. The relevant criterion is the position of the rotational axis of the movement. The first case demonstrates the flexion-mode (a) with the rotational axis on the concave side of the knee. The midline through the knee shortens because the lengthening on the lateral side is less marked than the shortening on the medial side, the joint gets compressed. In (b) the structural condition of a lengthening of the midline is met. With the rotational axis on the convex side the lateral side lengthens more than the medial side shortens, resulting in a lengthening of the midline. If the rotational axis is in the center of the knee (c) the flexion on the medial side is compensated by the extension on the lateral side. The length of the midline is not affected.

the midline of the leg. Therefore the structural consideration requires simultaneous straightening and lengthening of the midline if the knee is to be brought towards normal.

Ill. 2 demonstrates three ways of holding a knee away from its medially deviated position towards geometrically normal. The extension-mode, as shown in Ill.2 b), is the only one which satisfies the structural condition of lengthening the midline of the leg.

Formulated as a principle, the extension-mode demands that the incidental axis of rotation of a movement should be on the convex side. It applies to all interventions involving a passive movement which are intended to be integrative.

If in practice the intention is to lengthen the primary shortness on the lateral side of the knee in a X-leg, the medial side has to be prevented from shortening. The same principle applies when work is done on the secondary shortness of the medial side. In this case the lateral side has to be kept long in order get the midline to lengthen. This technique requires the use of both hands simultaneously to work on the intended element and to take the related part of the body towards normal in a structurally integrative way.

The concept that a functional or structural lengthening of fascia must involve a lengthening of the midline is not restricted to anatomical or functional joints. It is an important consideration for all interventions anywhere in the body because there is always a corresponding "other side" somewhere, with a midline in between.

A typical application of the principle is in back-work with the client sitting on the bench. In lengthening the fascia of the back or parts of it, the front wall of the trunk must not shorten but remain long. Otherwise changes in the geometry of the body are most likely just a result of short lived physiological adaptations of muscle tonus.

### 5.2 Active Movements

All active movements of the client should be in the extension mode of Normal Function. The three criteria to be considered are: 1. initiation by selective relaxation of muscles on the extension-side, 2. the midline of the body lengthens initially, 3. momentarily improved balance. The last point applies particularly to movements on the bench or in standing where it can be felt easily by the client as "grounding".

An analysis of the movement "toes up", with the client in the supine position on the table, illustrates the implications of Normal Function. Asking the client to feel her own weight leads to a relaxation of the back side which supports her body. A simultaneous relaxation of the abdominal wall has several effects at the same time. It allows the pubes to go distally and it tilts the pelvis anteriorly without shortening the back. This takes the midline of the trunk towards anterior convex and lets the hips sink into the table. Both legs participate, but on that side on which "toes up" is intended to happen the sinking in of the hip should be more accentuated than on the other. The effect on the leg is now similar to Folding in standing<sup>13</sup>. As the groin goes into slight Folding the thigh detaches and the knee-joint opens by going into slight flexion. The whole back-side of the leg is now relaxed. At the same time the muscles on the front of the leg are prevented from contracting consciously. As a result the whole foot slides away distally, the ankle-joint opens and allows a movement in the extension-mode: The heel goes caudal and the toes begin to move cranially, relative to the heel.

The visible signs of Normal Function in this movement are the sinking back of the hip-joints which are flexed in the extension mode, a similar slight flexion of the knee, and the completely relaxed quadriceps femoris. In this way, the apparently simple movement of "toes up" engages the fascial net as a whole, lengthens the midline of the entire body, and exposes short areas in the fascia by a reduction of muscular tonus.

### 5.3 Theoretical Aspects

The theory of the extension mode, as it pertains to touch, can be looked at from three different perspectives: the

structural, the geometrical and the physiological viewpoint.

#### a) The Structural Aspect

The body as a hydrostatic balloon is never as long as it could be under "gravity-free" conditions. The field of Structural Integration distinguishes three factors which cause the the body to shorten: 1. The gravitational weight of the body together with the Normal Force as the reaction from the ground below<sup>14</sup>, 2. the passive tension of the fascial net, 3. the active tension in the fascial net resulting from the tonus pattern of musculature. All three "jam" the body and shorten its midline<sup>15</sup> or that of any of its parts (Ill. 3).

Structural deviations constitute the fourth factor which contributes to further shortening the midline. Over short periods of time, e.g. in movement, it's the tonus pattern which functionally holds and adjusts the shifting weight of the body segments. But longterm deviations are checked by a build-up of fibres in the fascial net, leading to a thickening and rigidification of fascia and to shortness in the body.

As the body does not possess facilities to prop up any of its elements, the effect of these chronic deviations and the structural reaction to it is a shortening of the midline as shown in Ill. 4 on the example of an X-leg. It is the same drawing as in Ill. 2, but this time with the lower leg in a vertical position and the introduction of forces as in standing. The basic mechanism of the interaction between aberration, forces and reactions of the fascial net illustrates the importance of the extension-mode in integrating structure. The body can only be brought back towards its initial arrangement if the midline is lengthened.

#### b) The Geometrical Aspect

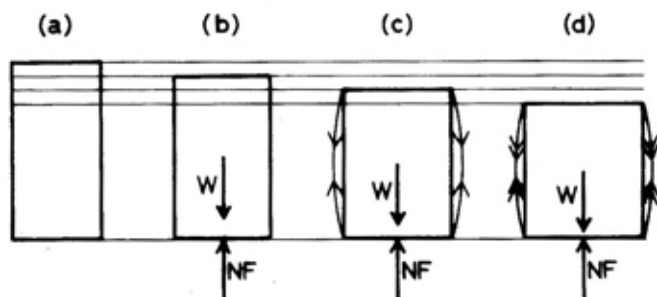
The geometrical aspect has already been introduced in Ill. 2 and Ill. 4 with the situation at the knee-level as an example. It relates to the image of "How to Create a Banana"<sup>16</sup>. For the purpose of integrating structure it only has to be reformulated to "How to Uncreate a Banana", going from c) towards a) in Ill. 4. The core of a body, or of any of its parts, is usually thought to be "somewhere" in the middle of the body. The concept of the extension-mode which directs the intention of an intervention to the midline will therefore always affect the core.

14 Only the interaction of weight and Normal Force shortens the body. The initial free fall of a parachuter is caused by the weight of the person, but the body is not shortened because of the absence of the Normal Force.

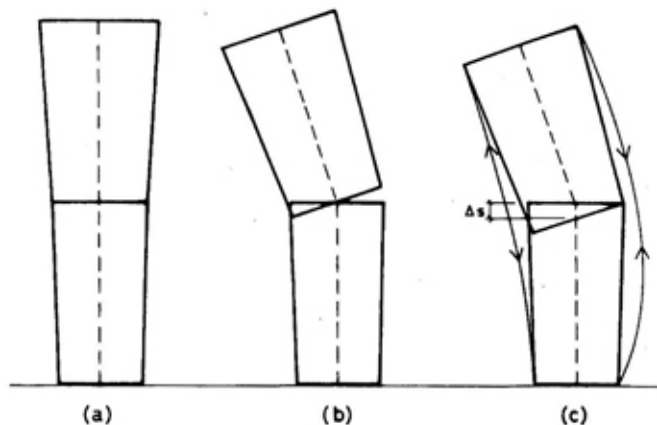
15 For the definition of "midline" see Notes on S.I. 91/1, p. 24-26. For all practical purposes the geometrical and the gravitational midline can be assumed to coincide.

16 cf. Notes on SI, 91/1, p. 11

13 cf. Notes on S.I. 91/1, P. 16-18



Ill.3: The model shows how the initial "weightless state" (a) is compressed and shortened by a successive superposition of the three forces resulting from gravity and Normal Force (b), passive tension in the fascial net (c), and active tension in the fascial net from the muscle tonus (d).



Ill.4: a) The hydrostatic norm with a straight vertical midline, compressed by the three forces mentioned. b) The geometrical deviation of a valgus knee without the reaction of the fascial net. c) The lateral concave side is compressed by the weight from above leading to primary shortness of the fascia. On the medial side a secondary shortness of fascia due to chronic muscle contraction "saves" the leg from collapse. The midline of the leg at the level of the knee shortens by  $\Delta s$ .

### c) The Physiological Aspect

Physiological considerations regarding the nervous system and the tonus pattern are of particular importance for active movements by the client. Movements and changes in the shape of the body are usually described in terms of flexion and extension.

An isolated movement is then defined by its axis of rotation, by the incidental perpendicular plane in which one part of the body moves relative to another, which is held stable, and by the rotational direction. The nervous system coordinates the muscle tonus which results in geometrical changes on both sides: the lengthening on the extension side and the shortening on the flexion side.

In Normal Function, which is initiated by a relaxation of muscles on the extension side, the flexion side shortens, as a minimal condition, less than the extension side lengthens. As a maximal condition it lengthens as well, although less than the extension side. The overall decrease of the muscular activity in the extension-mode lets the midline become longer and this in turn makes fascia more available. This last point, that the extension mode makes fascia more available, needs to be explained.

In order to distinguish between structure and function, the field of Structural Integration distinguishes a "structural body" to which a "functional element" is added, resulting in the "body-in-function". The whole of the fascial net (enwrappings of organs and muscles, tendons, ligaments, periostium), forming the "bags", plus their contents (organs, muscles, bones) constitute the "structural body". The active tension exerted by muscles on the fascial net makes up the immaterial "functional element". The total of this muscular activity is the tonus

pattern of the body which of course changes constantly and can be anywhere between "zero and tetany".

In reality the structural body can never be separated clearly from the tonus pattern, but it is possible to say something about their relationship. The relationship of passive tension in the fascial net to active tension resulting from muscular tonus can and does change. It is on a sliding scale with the endpoints "pure passive tension" on one side and "pure active tension" on the other.

The status of the "body-in-function" is always somewhere between these poles. It is either more passively tensed in the "fascial mode" or more actively tensed in the "muscular mode". The actual point on the scale is determined by the level of activity in the tonus pattern. An increase takes the body towards the muscular mode, a decrease towards the fascial mode.

In the hypothetical case of the muscular activity at zero, we would be left with the structural body, and what we could feel with our hands would only be the passive tension of the fascial net: i.e. structure pure. It is of course neither possible nor desirable to reach this point. But taking the body as much as possible towards it brings us closer to structure and makes the fascia, the medium of structural intervention, more available.

Active movements of the client, particularly on the table, are usually small and controlled movements. They are mostly below the range where active muscular contractions become necessary and can therefore be done entirely in the extension mode. The preconditions are a proper instruction of the client and a skilled and careful monitoring of the movement by the practitioner.

Such movements by a selective relaxation of muscles are in several ways supportive for the the work of integrat-

ing structure: The midline of the body lengthens, the joints open, structural restrictions become apparent, and the shift of the whole body towards the fascial mode brings the fascia to the surface.

## 6. Breathing

Breathing changes the shape of the whole body all by itself. This change is of course functional and not structural. An analysis of breathing on the basis of Normal Function allows to define Normal Breathing. Knowing what Normal Breathing is and how it looks in practice is useful for two reasons. Specifically, with function in mind, the normalization of breathing is part of the process of integrating structure. The theory of Normal Breathing provides criteria for assessing the way in which the breathing of a client deviates from normal. This allows to see where and what the restrictions could be. On a more general level, breathing in the extension-mode – by a general relaxation of the muscular tonus – takes the whole body towards the “fascial mode”.

Of the two phases of the breathing-cycle, inspiration and expiration, the more interesting element is inspiration. It is usually considered the active energy-consuming part of the cycle.

The application of the theory of Normal Function to breathing yields very simple results. This should not be a cause for concern or puzzlement, but seen in the light of the widely held view that simplicity is a direct measure for the quality of models.

### 6.1 Inspiration

On the inhale the trunk gains around 2% of volume. The resulting change of shape will first be analyzed geometrically and then functionally.

#### Geometrical Aspects

The additional volume can be gained in a number of different places: in the thorax, in the belly, in the back, by lowering the pelvic floor, etc. From geometry we know that for a given volume increase the smallest change of shape will occur if it is evenly distributed over the whole initial space. An inflated balloon with a certain initial volume and surface-area can serve as a model. A further inflation by an additional volume of air increases the surface area. The increase of area is minimal, if the balloon expands evenly in all directions of space. This is usually the case for a balloon with a homogenous skin.

If the rubber skin is not homogenous, with the material thicker or less elastic on one end, then the other end expands more and absorbs more of the additional volume. The surface increase is bigger than in the optimal case with the homogenous surface, and the shape of the balloon changes more. The geometrical model and its transposition to the anatomy of the trunk of the human body already imply what will be discussed in the next paragraph: that maximal economy of function presupposes a minimal increase in surface-area.

Extension in all directions of space in inspiration

means for a human body, in analogy to the balloon, that the midline of the trunk lengthens along the longitudinal axis, and that the diameter of the transverse planes increase in all directions.

Since the body is not a homogenous balloon, a number of questions need to be asked: How does a longer midline manifest? How does the spine behave? Does the diameter increase differently in the sagittal and the transverse direction? Where do we have to make allowances for bony restrictions? A first approach to such questions can be found in “Elements of a Structural Theory of Breathing” (Notes on S.I. 88/1).

Qualitatively and quantitatively the most important, and in practice the most obvious, aspect is the lengthening of the midline of the trunk along the longitudinal axis. The midline, as defined, is the median between the front and the back wall of the trunk. With the upper thoracic aperture as the starting point, the distance from the clavicles to the pubes is a measure for the length of the front, the distance from C7 to the ischial tuberosities for that of the back. For anatomical reasons the front has a bigger range of lengthening than the back which is restricted by the bony spine. It follows that if a straight midline of the trunk is taken as the starting point, it will go towards anterior convex if the trunk is to gain maximal length in inspiration. A more detailed inspection shows that the direction of the changing midline in the trunk is always the same. It is not limited to an initially straight midline. In the case of a posterior convex midline at the outset, a minimal condition for breathing to be normal would then be that it moves towards straight or “less posterior convex”. In all cases the solution to the problem of gaining length along the midline is a variation of the question of “how to create a banana”.

As a condition, the criterion of the anterior convexity of the midline of the trunk is necessary but not sufficient. A practical experiment on one’s own body shows that it is possible to move the trunk into an anterior convex configuration and shorten it at the same time. A second criterion which assures that breathing is normal comes from functional considerations.

#### Functional Aspects

The three criteria for Normal Function have already been mentioned. The first criterion, that a movement should be initiated by a relaxation of muscles, leads, in the context of breathing, directly to the question of the surface increase of the trunk. Again an inflated balloon can serve as the model. But in addition to the change of geometry we have to analyse the properties and the behaviour of the enwrapping of the trunk which corresponds to the rubber skin of the balloon. In the structural model its tension has two components, the passive tension of the fascial net and the active tension provided by the tonus pattern. Both elements manifest as tensional forces, acting in unison, on the “fillings” of the trunk. These are compressed by them. If the rubber skin of the balloon-model had “muscles”, they could be relaxed and would reduce the tension of the rubber skin. The volume and the surface-area would increase and the pressure

inside decrease. The human body has this capacity, it can reduce the tension by lowering the level of muscular activity and increase the volume and the surface of the trunk. The resulting decrease of pressure inside leads to a vacuum relative to the atmospheric pressure outside and draws air into the trunk.

That is what Normal Function requires from inhalation: a general relaxation of the trunk musculature to increase the volume inside. For a given volume of inspiration, the necessary relaxation and the ensuing increase of surface-area is minimal if it is distributed evenly over the whole trunk. In other words, a relaxation of muscles is most effective; and renders the biggest additional volume, if all the muscles are involved. The movement of the midline of the trunk towards anterior convex as a sign of Normal Breathing can be explained functionally by looking at the sagittal cross-section. With the body at rest, just before the inspiration, the longitudinal tension in the surface membranes of the front and the back keep the trunk in equilibrium sagittally. In inspiration, the muscles of both sides relax to allow the midline to lengthen. Front and back have to relax simultaneously and by an equal amount if the equilibrium is not to be disturbed. Otherwise the trunk would be bent and move forward or backwards. The equal decrease in tension leads to unequal extension of the two sides, because the back side with the bony spine as a restricting factor has a smaller capacity to lengthen. Therefore the effect is a functional adaption of the midline of the trunk towards anterior convex.

As with the geometrical view-point, the functional one leads to further questions regarding the details. An example is the role of the diaphragm in breathing. The theory of Normal Function provides a surprisingly simple answer. The diaphragm acts as a variable membrane between the upper and the lower cavity of the trunk. Physically, all the air of the inhale obviously goes into the upper cavity of the lungs and not into any other parts of the body. In the initial phase of inspiration, the diaphragm relaxes as part of the general relaxation which starts normal breathing. It is flattened out by the widening of the lower thorax and sinks down towards the visceral cavity. The sinking is assisted by the slight vacuum in the abdomen – caused by the increasing volume of the lower trunk – which draws the diaphragm down. In this way the diaphragm allows the body to use not only the expansion of the thorax but also that of the lower trunk to create the necessary volume for the inhale in the upper cavity. The advantage is a minimal increase of the surface area, of which a substantial part can be gained by a relaxation of muscles.

The third criterion of Normal Function concerns balance. It should improve momentarily in all movements and therefore also in inspiration. The situation is quite simple for a person lying on the table. The inhale in the extension mode widens the trunk in all directions and increases the surface of whichever side of the body rests on the table. This increase of the support area directly improves the balance. The circumstances are more complex in standing or in sitting but the principles remain the same. For the purpose of understanding the

connection between touch and breathing it is sufficient to limit the inquiry to the body lying on the table.

There is a further physical phenomenon which assists and stimulates muscle relaxation in inspiration. As the trunk lying on the table expands in all directions of the transverse planes, the center of gravity moves slightly upwards. As a reaction, the trunk is pressed noticeably against the table and, depending on the softness of the surface, to some extent into it. The effect is a further increase of the contact area between the body and the table and, if the pressure is consciously felt, an increased feeling of support. Directing the attention of the client to sense the support from below often leads immediately to a perceivable relaxation of the body.

### *6.2 Working with the Breath*

There is no simple way of verifying the presented hypothesis on Normal Breathing. The visible effects are small and the qualitative difference which matters, the one between a slight relaxation and a slight contraction, is not always easy to discern. The following analysis of the behaviour of the trunk as it relaxes on the inhale in the prone position should allow, as an approach, to experiment with one's own body by trying to sense the signs and manifestations of Normal Breathing mentioned. One's own experience provides an understanding of the two interventions described below which illustrate the use of the concept of Normal Breathing in the practice of touch.

#### Inspiration in the Prone Position

When lying horizontally, the image during the inhale should always be of letting the breath trickle down along the side which touches the table. This directs attention to the support of the trunk. In the prone position the chest and the belly are below and supported by the table. As the whole trunk relaxes, they sink into the mattress more deeply. As a reaction the back wall is lifted up by the air flowing into the body. The sagittal diameter of the trunk increases. An image would be a flat car tire which is being inflated. The lower surface is pressed towards the ground and from there the rim is lifted up as the tire widens while it is being filled.

In the longitudinal direction the front wall extends first from the sternum to the pubes: the first going in the cranial, the second in the caudal direction. As the breath reaches the pubes and the anterior part of the pelvic floor, it rises and goes over and behind the pubes into the pelvic cavity. The breath then also takes the posterior side of the pelvis with the ischial tuberosities caudally and helps the relaxed posterior side of the trunk to lengthen.

#### Hamstrings

An intervention on a client in the prone position with the intention of lengthening the fascia of the hamstrings shows that the effect of Normal Breathing is not restricted to the trunk. The passive caudal movement of the ischial tuberosities in the later phase of the inhale

reduces the passive tension of the fascia of the hamstrings. The hand, working in the caudal direction of the hamstrings, first waits for this slack induced by the inhale, takes it up, and then holds the fascia distally and away when the tuberosities again move cranially on the exhale. With each inhale the hand moves further down, holding on during the exhale and lengthening the fascia progressively.

The traction on the back side of the leg tends to pull the posterior side of the pelvis along, inducing a posterior pelvic tilt. This has to be checked by the controlling hand on the gluteals and if necessary prevented by holding cranially against the working hand. A posterior tilting of the pelvis eventually moves the pubes in the cranial direction. This would shorten the front of the trunk and so inhibit Normal Breathing.

### Lying on the Side

The flow of the breath is similar to that in the prone position. It first flows along the supported lower side, extending it, and then it rises up to lengthen the upper side.

If the intention is a general lengthening of the fascia of the side, the trunk of the client should be anterior convex, but only as much as is comfortably possible. The convexity goes from the clavicles to the pubes in front and from C7 to the the ischial tuberosities in back and should not be produced by an anterior tilt of the pelvis.

For a move upwards, the controlling hand holds the iliac crest caudally while the working hand pushes cranially on the side of the trunk. On the inhale it can be felt how the body relaxes and the side lengthens between the hands. As the working hand takes up the slack of each cycle, the tissue should be felt to become progressively resilient because the body moves, as with the hamstrings previously, towards the "fascial mode". At the same time both hands assist the movement of the trunk towards anterior convex in inspiration. The intervention thereby also serves as a diagnostic tool. It is usually easy to see which parts of the trunk's fascia go along with and which parts restrict the free motion required for Normal Breathing. A subsequent intervention may then be directed at those particular places.

As in all unilateral interventions, the behaviour of the opposite side has to be monitored carefully regarding a functional contraction. With the client lying on her side, the lower side has to stay long because the effect of the intervention on the upper side brings the trunk as a whole towards integration only if the midline is allowed to lengthen.

## 7. Hinges

An intervention, or a series of interventions, with the intention to free a joint does not in itself lead to economy of function which is the eventual goal of integration. Taken to its extreme, a loose hip-joint for example, might allow stunning contortions of the body for someone doing acrobatics. But in walking the knees would have to be actively prevented from going in all kinds of directions

instead of swinging in the sagittal plane.

The hinge criteria, as they have been developed in the Notes on Structural Integration (88/1; 91/1), define order as a precondition for functional economy for the human structure in movement. As such, they provide a relevant tool for the practical work. In the following, the term "hinge" is defined, and a summary of the three hinge-criteria is presented, with two examples of their application in the practice, to illustrate their relevance to touch.

### 7.1 Joints and Hinges

"Hinge considerations are, in the field of Structural Integration, the equivalent to what 'joint theory' is in other fields" (Notes on Structural Integration, 91/1). A hinge is an axis of rotation which conforms to the criteria of Normal Function, which is the case if movements are in the extension mode. The axis is considered a functional unit between two adjoining elements of the body, which is more than just the articulating surfaces of the anatomical joint. Confusion can arise from the fact that, in many cases, anatomical joints and functional hinges are close together. An example is the hip as the "articulation" between the "pelvis" and the "thigh". The anatomical joint-axis is defined by the acetabulum and the caput femoris. The more abstract hinge consideration looks at all factors, including the changing angle of the collum femoris relative to the ilium and the behaviour of the fascial structures involved which all change the geometry of the hip as it moves. The hinge-axis can, for instance, move visibly anterior or posterior as the hip flexes.

Ida Rolf stated: "Knees, as well as ankles function in accordance with [this] structure; like a door hinge, they work best and most economically in a single plane of movement – forward and backward. Ideally, movement of knee and ankle joints themselves should be parallel, and the joints should be centered one above the other." (Rolf: p. 52).

She doesn't distinguish clearly between hinges and joints, but talks about the "hinge-function of joints". A joint is a concept from anatomy for the cartilaginous interface between two bony elements which can be taken apart in a dissected body. This reflects a traditional point of view which attempts to explain the whole by setting out with the smallest elements.

A look into the anatomy-book reveals the complications of such an approach. The function of the ankle-joint is explained as an interaction of the trochlea tali, the facies malleolaris lateralis and medialis of the talus with the facies articularis inferior and facies articularis malleoli of the tibia on the medial side, and the facies articularis malleoli of the fibula on the lateral side. Further elements which influence the movement of the same joint are the articulatio subtalaris, with three joint surfaces between talus and calcaneus, plus the articulatio talocalcaneonavicularis, which in itself is even more complicated than it sounds. Only a rigorous simplification allows comprehensible statements to be made about the function of the joint, concerning this approach.

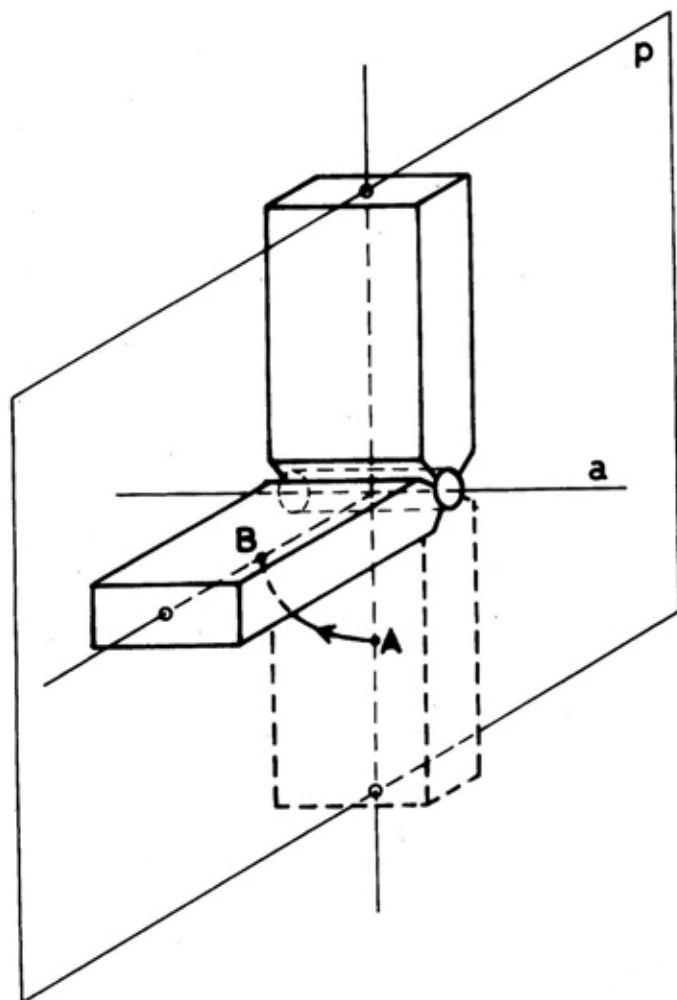
The hinge-theory of Structural Integration reverses this hierarchy. It starts with looking at the large functional units involved in a movement around a rotational axis and derives the criteria from this viewpoint. The analysis of how joint surfaces relate in movement is then only a second or third step. In the context of the whole, this approach takes the concept of functional hinges on to a higher, more abstract logical level than the concept of anatomical joints. The two are sharply distinct.

### 7.2 The Criteria of Hinge Function

The criteria of hinge function are presented in a summarized fashion as they have been developed for function. The following paragraph deals with their transposition to touch.

Ill. 5 shows the geometrical abstraction of a hinge in a movement of one segment against another or of two segments against each other. The rotational axis, the hinge axis, stands perpendicular to the plane in which the midline of the segment, or the segments in question

Ill.5: The hinge-axis *a* and the plane *p* in which the center of gravity of the lower segment moves stand perpendicular to each other. The shortest path for the center of gravity from *A* to *B* is in the plane *p*.



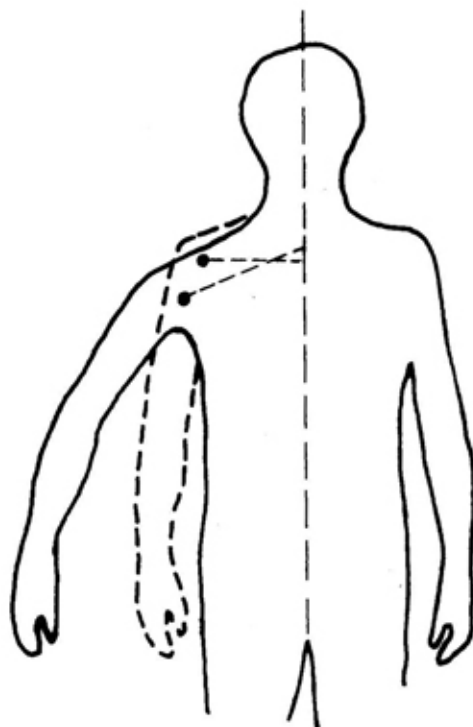
move. The economical basis for the model is the definition of energy in physics. The amount of energy necessary to move one segment around the rotational axis is equal to the resultant force involved times the displacement of the mass-center of gravity ( $E = F \times s$ ).

The product "E" as a measure of economy is minimal if both "F" and "s" are as small as possible. The extension mode of Normal Function defines the criteria for minimizing the required force "F". The displacement "s" is minimal for the geometrical conditions shown. It increases if the center of gravity of the rotating segment deviates from a straight line, because the straight line is the shortest distance between two points. Economical considerations exclude of course the possibility of using muscular force to keep the center of gravity on a straight line.

The three criteria for hinge function are:

- (1) "The axis of rotation initially goes toward normal and back in a circular movement instead of away from normal and back."

Ill.6: The elbow which leads the movement of the arm to the side is first sensed to become heavy. As the muscles of the shoulder girdle relax, the shoulder-hinge sinks and moves lateral, away from the center of the body. At the same time the hinges of elbow and shoulder align relative to each other and towards the sagittal direction.



A typical example is the movement of an everted knee in Folding.

The knee axis which goes from lateral posterior to medial anterior has to go, in order to conform with the hinge criterion, towards the normal transverse direction as the knee is left to go forward. In the opposite case, a further deviation takes the knee more lateral, away from the sagittal plane, which it should approach in the movement. This increases the length of the path of the leg's gravitational center and rises thereby the energy consumption. On the anatomical level the consequences are constraining forces in the joint itself which increases "F", the other factor in the energy equation, and contributes to make the movement still more uneconomical.

- (2) "The axis of rotation initially goes away from the center of the body instead of towards it."

This second criterion is commensurate with the Normal Function criterion that the midline should lengthen. In letting the arm go out and up in the frontal plane, the shoulder hinge must sink and move away from the trunk (Ill. 6). The elements involved relax and open, including, of course, the cleft of the articulation humeri. The whole trunk is decompressed slightly.

- (3) "The axis of rotation initially aligns better with the other axes instead of worse."

Folding involves the simultaneous movement of four transverse axes<sup>17</sup>. It is initiated in the extension mode, therefore the body is decompressed, lengthens, and derotates to allow for the gain in length. The derotation reduces the deviation of all transverse axes and aligns them better with respect to each other and to the frontal plane. The degree of their deviation out of the horizontal plane should also decrease as the axes go towards parallel.

### 7.3 Hinge Function in Touch

Hinges and deviations in hinge function can only be identified in movement. In the context of Structural Integration it is necessary to distinguish a functional from a structural hinge deviation. Deviations can be and often are produced by habitual muscular efforts and are therefore functional in nature. But muscular contractions distort the structural picture. Therefore only movement conforming to the conditions of Normal Function, which minimizes the use of muscles, can reveal structural restrictions regarding hinge function.

The hinge criteria provide a strictly rational basis for the technique of "tracking", an idea which has been around for a long time in Rolfing. The following are two examples, the first one for passive movements with the

client on the table, the second for active movements with the client standing.

#### Passive Movements

The intervention is at the knee, with the client in the supine position. As the practitioner lifts the knee up the knee-hinge has a number of possibilities to deviate further away or towards normal: by a rotation of the thigh around the longitudinal axis, by a lateral or medial transverse shift of the center of the knee (1); by a proximal or distal shift (2); by aligning better or worse with hip- and ankle-hinge (3). (The numbers correspond to the hinge criteria.)

Moving the knee-hinge upwards passively reveals the structural restrictions responsible for the deviation if tonus is low. The fascial elements which are short are often visible and can always be sensed with the hands by holding on to the tissue around the knee. They can be addressed by tracking in the way to be described in the next paragraph or by any other suitable method. Testing afterwards will show if the situation has improved<sup>18</sup>.

The conditions for Normal Function have to be observed in the passive lifting of the knee. A proximal shift which jams the hip, disregarding condition (2), can either be caused by a undesirable "participation" of the client in the flexion mode, i.e. by a muscular contraction; or by a number of structural restrictions cranial of the knee; or by a combination of both. The presumed causes have to be identified and again addressed by an appropriate intervention.

If a visual check doesn't give enough clarity regarding the movement of the hinges relative to each other (3), it is best to work with the two hands at two different places. One hand may lift the knee passively, holding its transverse axis perpendicular to the sagittal plane of the body while the other hand may check the hip-hinge in the groin, on the proximal attachment of the rectus femoris or more lateral on the tensor of the fascia lata. Knowing where in the fascial net restrictions are located which cause the alignment to deviate gives clues for the intervention.

#### Active Movements

Tracking the ankle hinge in Folding is an example for an active involvement of the client in the field of gravity. With the feet parallel the client is asked to let the body go into Folding. As the midline through the whole body lengthens, the foot softens and becomes longer, the heel going back. The lower leg slides slightly back on the talus, taking the ankle-hinge along in order to conform with (2). Kneeling behind the client, the practitioner holds the ankle in a way to assure that the rotational axis stays horizontal and perpendicular to the sagittal plane. The fingers in front of the malleoli assist the movement of the hinge sliding back. In the downward part of Folding it is the weight of the client's body which does the work. Going upward the practitioner holds the ankle so that the hinge stays back and aligned to the transverse axis. The client participates by letting the feet remain

17 cf. Notes on S.I. 91/1, p. 16

18 Of course it can't be expected that a local intervention at the knee integrates the whole structure. A deviation at the knee may be caused by a restriction at the hip which again may be caused by a structural posterior pelvic tilt. It is therefore necessary to look at the fascia of the knee as part of the whole structure.

soft and long. Throughout Folding and Unfolding the practitioner's mind and his action are focused on the element of order, the prerequisite for structural integration and economy of function. This presupposes a clear image of what order means, how it looks in reality, and an ability to come up with a suitable concept for the intervention.

Controlling the alignment of the other axes (3) is more difficult in this intervention. But if Folding is explained adequately to the client beforehand, the relationship to the other axes should at least not become worse. A tendency of clients is to evade the strain in the fascial net caused by the intervention, by muscular adaptations in the upper axes instead of letting them align by a maximal reduction of the overall tonus pattern. A reliable sign for a contraction farther up in the body, which can be monitored while working on the ankle, is a contraction of the feet.

## Conclusion

Seven elements of touch have been presented to substantiate the claim that there exist identifiable aspects of touch which are relevant to the field of Structural Integra-

tion. The list is not exhaustive and there is certainly a number of non-technical considerations of importance as well.

A further intention of this attempt to describe elements of touch in a systematic way was to show that well founded knowledge constitutes a base which is indispensable to consciously assess the role of intuition and experience and make them productive. It is the relationship between the sensory input from hands and eyes, the perception of what takes place, and the concept of what should take place in one's mind which connects the three parts of the cycle: analysis, intention, intervention.

The practitioner "feeling good" by what he does as well as the client "feeling good" by how he is treated can be misleading because it is not necessarily related to the integration of structure. There are a number of other techniques, with goals and intentions quite different from Structural Integration, which can convey a "good feeling" just as well if not better. The aspect of structure is rarely prominent in the consciousness of a person, and most clients have no clear idea of what a Rolfer exactly does. Therefore it is the Rolfer's responsibility to know in which way her/his touch relates to the premises of the field.