losing changes Halliwick in 1986
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The four aspects of rotation.

McMillan ?

Halliwick is devided in to four phases.
First we have to gather information about water, the human body, and these are too very indetinice areas of knowledge. When we gather these two pieces of information together we have to sought it out to find what it relate to the work that we carry out.
This comes to what I call the link, what fitts with what we want to do with the human body.
After this the fourth phase is expression, how are we going to use this knowledge but this you might see portraited in the videos that follow.
What we want to concentrate on the moment is the synthesis or the link which is the four aspects of rotation.
So this presentation is to examine the cause and effects of rotational body movement in water.
When the body is lying supine in the water and the eyes are devated to the left the body will start to rol to the left from the midline position.
What happens then, the sequence that follows are predictable. The left arm will be probably moved away from the side and the distance it will be moved depends entirely on the speed of which the body is rotating.
With this you will probably find there is a slight extension of the head. This simple sequence faces everyone working in a teaching situation in water.
Yet, most are unaware that it has happened. The human body is very unstable in the body and the slightest change of situation will cause it to be rotated.
This will occur either around the longitudinal axis of the spine or the transverse axis of the hips. You can get a situation where two rotations occur at the same time in a combined movement.
For the body lying in water this is very hard to identify this and therefore even harder to create a situation of control.
So to simplify this complexity of interrelated rotations the subjects are divided into four phases, which are:
- anotomical, a view of body construction and its

significance on rotation;
- developmental, how the movement of the body is related to the environment and how it learns from its experience;
- handicap effect or the basic imbalance, the relationship of specific handicaps and their effects on rotational control in water;
- metacentric effect, the use of the interrelationship of the effects of gravity and upthrust of the water and how through training this can be used to stabilize the body or create a mentally desired and physically controlled movement.

To state the obvious, we are not going to go into neurology, into anatomy, into fluidmechanics in great depth.
We are going to take the approach known under the philosophy of General System Theory.
What we are going to try and do is to take out from these disciplines just the information that applies to us.
Many of the statements that I will make can be found in medical or scientific literature and many more cannot be. Those that cannot be have been verified by myself over years of experimental procedure, not just with the handicapped but wit every courseremember that we have had now.

The first thing that we want to look at is anatomical. (drawing joint).
Two bone-ends are held together by a capsule. Across those bones are muscles and these muscles never come straight across a joint and never do these muscles work in directlines.
They always have a capability of some rotational movement.
A joint is thus capable to make patterns of rotation in more planes.
How does the body know what is happening? On the ends of these muscle spindles there are nerve endings which are telling us whether the muscle is extending, shortening or at what speed is it occuring.
We are getting a feedback through the muscles.
The bone-endings also have nerve-endings which tell us what position the joint is in by the impulses we are getting from them.
The one other thing that we want to know is this: all of these procedures are magnified if we approximate the joints. When the joint is under load the muscles must increase in tone to hold the joint together under load.
This proprioceptive feedback is telling us where our body is in space.
I want to look at the effect of approximation of the joint.

So we see now we get recognition of position and action: proprioception.
Now, let's have a look at tone.
This person is very thin and the weight therefore is not so great. If you look at the way this person stands, it is always in a "bend" position. There is no hyperextension such as there is with a very fat person. He has hyperextended knees etc., because of his extreme weight.

Here you see the difference of the effect of weight. The thin one is almost hypotonic and the fat one is hypertonic. So tone is very much a quality which is changable.
Let's have a look at the other ways in which tone can change.
In a normal person, while moving at one level, tone must be relatively the same. Immediately when you move

upwards you are working against gravity. The muscles must do more work and the joints must be held more firmly.
So there must be a slight increase in the tone of the muscle.

When we put a pack on our back, the first few steps we flex a little and gradually we come to a more upright position.
After walking like this for a while we are in the same situation as the fat man, with hyperextended knee joints in particular when we take the pack off, we still see a hyperextension and it takes a period of time before we come back to our normal state.

So we have a normal situation, a "plus" situation and we have "minus" situations as well.
Suppose we put a person in water up to his neck. The person still stands but we have relieved the gravity situation because we have lifted the weight off the body.
This means that once the water is over 1ml. the upthrust effect is greater and greater.
Would a person be hypertonic in this situation? Of course not. although this has been said for years.

It follows from the law of conservation of energy that if the body does not have to work it will switch off. It will not carry on useiessly working.
We find a loss of tone!
But we are losing also the sense of approximation. This means that there must be a greater range of movements in the joints. This is what we see in water too.

How do I know my body when my body is in space. I have now lost to some degree the full effects of proprioception.
But we still have the tactile system working, we feel the flow and the pressure of the water around us.
We have got a change over of the systems and now, in the water, we are working by tactile response.
So, we can put forward this concept:
If the body is placed on a different surface, in a different element, in a different environment it will change its system of relationship with that environment.
This was not believed until we got data from space.

We have seen that is we put the water levelsnigh, that we are changing over from a proprioceptive system to a tactile system. At what point does this change over occur?

In the human body the normal centre of gravity is at S2. But we must consider another part of the body. This is the floating mass the head, arms and trunk. The centre of gravity of this mass is at Thl.
We will find that when we increase the level of water to S2, it restricts our movements. As we start to increase the water level between S2 and Thl, we find that we are

losing identity of our movements.
At this we have the neutral situation. Here the feet are placed wrong, the heels are starting to rise.
When the water level is over this the heels are lifted and we are walking around in the water with the heels up.

Developmental.

We have to look at the differences between prenatal and neonatal conditions.
In the womb? everything is warm and soft and the baby can make every movement he likes.
The moment the baby is born this ability is gone.
Let us look to what happens after birth. The child lies with the head turned to one side. there is no muscular strength to hold the head in the midline position.
After the child can accept the midline headposition a series of movements take place. The child is moving all the time, it has no mature proprioceptive system at this stage in the development.
It is working by tactile stimulation (to which we refer when we go in water).
After a while the baby comes to a standing position and we see that it stimulates the proprioceptive system by stamping the feet, i.e. by approximation.
Then, it begins to walk and when it falls it goes into hipflexion. we do not see babies fall on their face.
This sequence of events is interesting because all the time is being protected by the so-called primitive reflexes.
When we consider the amphibious reflex, when the child makes bilateral movements, we see that it is related to a lack of lateral flexion in the trunk.
Across-lateral pattern develops when the curves in the spine develop. until this time the spine cannot rotate and flex at the same time.
Can the primitive reflexes disappear and be replaced by equilibrium reaction, etc.?
At first let's divide them in to three groups:
1. Pre/Neonatal: e.g. Glabella reflex;
2. Physical: e.g. ATNR;
3. Survival: e.g. rooting reflex.

And we have to know: what are the reflex activities for?

In fact the Physical reflexes must be considered as reactions. Reflexes are responses to nerve stimulations which are always the same in effect and purpose and is invariable.

A reaction is a response to the vestibular system and head position where the response can be recognized and is variable and will be refined to a point where it will be thought to have disappeared.

We'll analyze the reflexes as an engineer would analyze them, because you're looking at an engineering approach. The Bianella reflex:

If I touch the baby's head in between the eyes, the eyes will close, that is the definition of the Glabella reflex. If I also touch the baby in the occipital area, I am going to get extension of the hips.

I'll also get it when I touch the baby between the eyes. Usually the manouvre is done on a resisting surface, so the hip extension is lost.

When I evoke with adults the same responses in water I can see very easily than when I touch you between the eyes or in the occipital area the feet wil drop because of hip extension.

Why does this occur? I try to give a reason.

The baby is about to be born and the head is in position and fixed and now the contracting wall of the uterus is in contact with the feet of the child.

It is essential that the child doesn't wobble like a jelly, it has a low tone condition!

So as the wall of the uterus contracts and the head is pressed down you get some form of nerve stimulation which virtually is similar to the hip extension and the feet are held in position against the wall of the uterus.

Why are the eyes closed? Protection!

The next activity of the child is to deliver the shoulders and therefore there must be rotation.

In natural birth situations certain mechanisms are necessary to help the mother and to assist the child.

When we touch the head in a different place, e.g. at the cheek 100%, all over the world rotate to the right.

Significant is that here we have the same stimulus producing extension and rotating to the right when touching at the left cheek and at the right cheek.

This is, in my view, the extension of the complete Glabella reflex and something that might be a reason for its appearance.

The rooting reflex: when you stimulate the cheek of a child it will turn towards the stimulation and starts to suck. The other point is, is the child also working by smell?

Both the rooting reflex and the Glabella reflex are invariable, but the ATNR isn't!

Let us see what are the physical reflexes for?

There is a principle called inertia; it is the lazyness of something or the difficulty of moving a body or a weight.

What matters is the radius around which the movement is taking place.

So let us look at the baby as like this ..... The

radius in any direction is relatively short, so movement is easy to create.
If the radius was longer, movement would be more difficult to create.
So we see movement is allowed by the very shape in which your body is made and the position of the spine, shoulder girdle and pelvic girdle etc.
So we get these movements or degrees of freedom.

The baby is maturing form the head down. First it had to get the head in the midline position. Having done that it mustnog mature the rest of the body.
What it needs is a fixed point against which it can work. it wants to build up tone and so we see patterns of movement away from the midline and to the midline. These patterns are ivetia patterns.
Let's look to the ATNR.

> When the bany is lying with the arms close to the side, it is capable of rolling movement one way or the other. if by accident it gets his hips and his head in rotation in the same direction it would be capable of rolling over.

But, as it turns its head in a direction we see now that the muscles that have matured start to come into operation. The head goes in a certain way and the same arm extends. This means the radius has been increased and the movement is blocker.
The body is fixed and maturation of the muscles at a lower point down the spine can occur.
if you look at the so-called physical reflexes, they are all ivertia patterns which occur either side of the body, never across the midline.
These ivertia patterns are contra-rotational patterns to fix the body and allow the maturation of the muscles and the development of specific movements.

Do these movements disappear? No, also with adults the ATNR can be observed! (e.g. a footballer going into a slide-tackle: one side of the body must work and one side of the body must be protected).
So, we can see that these so-called reflexes are associated with muscular development down the spine.
The ATNR is a reaction which is capable of being brought in, refined until apparently it disappears, but it is still there. This can be seen in the skater who has to perform a very precise circle while she is figure skating.
So it is in every movement that we make!
When I put you in the water and I inhibit the so-called reflex, I will inhibit all movement that goes with it.
When somebody is asked to press the arms against the side of the body it is impossible to swing the legs from the right to the left.
The feet will rotate, but lateral flexion cannot be made.
When the arms are released, the legs can swing accompanied by alternative arm movements.
This tells us:

> we must not hold the head in water;
> we must not hold the arms in water;

We must not inhibit reflexes!

How is the body working, what causes it to work the way it does?
How does the body develop itself in space?
The cortex uses certain levels for reception, for reason, control an inhibition and for key patterns.

A child has to develop its experiences of land activity. It receives some form of stimulus and the key patterns start to work.
You see this in water: people living in water, as soon as they feel themselves in lateral rotation, the arms come out.
First, stabilization is needed before one dares to move. Eventually a pattern is found and stored. The memory needs reinforcement: repetition is essential.
But when we teach errors, these errors will be remembered too.

As soon we change the environment or the surface the patterns must start to come again. Also, somebody who is all right on land will show different or impaired resoonses in the water.
They have to learn again, they have to place their centre of 'gravity in a different place. There must be a complete new learning structure.
There is in water!
The response has to be picked up from a different stimulus.

The same baby, 40 years later snows exactly the same patterns when he is drunk. He is trying to stand still.
So there must be a process of physical learning, described as:
- Mental Adjustment to the environment, the surface or the element;
- Balance Restoration. The balance has to be restored around the midline. Large patterns of movements, large inertia effects will be used to hold the body in position.
  When the skill develops the large patterns will be taken away.

* Inhibition/Facilitation not on the tape.

This gives a pattern of physical learning. How does this affects us dealing with the handicapped.

<u>Handicap effect.</u>

(drawing three wise men).

There are handicaps which affect movements of flexion and extension.
This is affecting the transverse axis, mostly through the hips.

think of the paraplegia, the spina bifida, the spastic diplegia.
In these cases we can see where the physical reactions are used. When the head is taken backwards, the arms are taken out and backwards. When the head is taken forwards the arms will go forwards as well. The position of the arms is totally due to the head position.
These handicapped are unstable in the direction of

flexion and extension.
The transverse axis of the hips is the critical axis on land.
The movement occurs around a relative long radius.
Therefore the balance reactions can be easily attained because of the low speed of the movements.
The next handicap effects take place around the midline.
One side of the body is affected.
Think of the hemiplegia or the one-side amputee.
The problem here is the problem of the short radius, movement around this axis is very easy to create.
The difficulty lies in lateral rotation and lateral flexion. On land you can not do this with ease but in water you can combine lateral rotation and lateral flexion.
When the body is put in a position of lateral rotation and the arm cannot be used to stabilize, the hips are used to create lateral flexion.
This has not been taught to the body, the body knows how to move.
We must give controlled situations within which the body can experiment and find out how to control the situation.
Posture must occur according to each individual. We are all different.

The lateral rotation is easy to create because of the short radius.
The hemiplegia thus has great difficulties. The hemiplegia establish their own axis and forget the hemiplegic side of the body. When you put a hemiplegic lying in water, the body will roll to the hemiplegic side, all the time, when there is no weight across the midline.
We can make them aware of the hemiplegic side, they cannot compensate. They must use it, extend it and equalize the symmetry of the body.
This is one of the great principles of working with hemiplegic persons in water.
Why should it be not good putting a spastic in water?
We could do more in water than people realize.
Finally we have the problem of combined rotation: two rotation occur at the same time.
E.g. A hemiplegic has a basic imbalance around the midline, he is rolling. When he wants to stand up he has to make vertical rotation around the transverse axis of the hips.
So the basic imbalance affects the desired movement, two rotations have to be controlled.

Metacentric effect.

The forces involved in the metacentric effect are the gravity force and the upthrust force. (In water) these two forces are almost always out of line. As soon as they do, there is a force couple, this causes rotation.

Examples: paraplegic/hemiplegic.