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Diagonals Part 9

Analysis of walking pattern. Learn to assess.

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Abstract

In this part we discuss the problems of two man after having an stroke. No individual after an stroke is the same and in this article all aspect that can influence the training negative are not all mentioned . Deficit in the brain that causes neuropsychology problems as agnosia /apraxia/ afasia /acalculia /alexia etc. have an influence in the treatment of stroke patient and will have an great influence on the outcome. But also the deficit of the frontal part of the brain will have very great influence on the outcome and what is possible. When the stroke makes the individual an different person that it is for all that care very difficult to continue to live and care for this person. But also trouble with the bladder and bowel can give great problems and there can be an deficit on the organ itself but also an malfunction in the brain and combinations are also possible. All sense (visual, hearing, taste and smell) can be disturbed on periphery level and central level except the sense from the body that is always an central deficit. Still it is possible to exercise with everybody after an stroke, even unconscious patient can be reach (Jan Lavrijssen and Henk Eilander) and sometimes the exercises have success.

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Not the change on an good success must be the motivation, but the individual with his problem must be the motivation to help him and that ask for an good assessment and then always start an treatment and be critical on yourself.

This two patient have an severe stroke but not so severe than the two patient in part 8 and by both lies the problems on several places and through an good assessment we can recognized the problems and also understand the influences of the problems on each other.

Participation of you as reader is wanted ! Try to assess the walking pattern of this two persons.

We have try to write this part on such way that you can exercises your thinking what is main problem before the solution is given.

This to give you the opportunity to train your own neurological thinking process. In this part we look first to walking pattern and try to make an assessment of the problems and possibilities that this two persons have after their stroke. Than the assessment will tell or our expectation are right. The diagonals will be the keystone and we give futher information about tone, perception, alignment and balance

The cooperation between the not-affected arm and the affected leg is so important but now we must try to see or this cooperation can start on the not-affected arm and goes through the remaining of the diagonal. Use of the cane can tell us that this person has learn to use the diagonal and that means that Motor Learning is possible.

The best way, now today, is than differential learning because only by repetition through variation the brain will seek for an solution and often the person has already found this, but have to little power to use it properly , therefore task specific resistance treatment and now we create something an little bit better. (Jan van de Rakt, Steve McCarthy-Grunwald Diagonals Part 9 Analysis of walking pattern. Learn to assess. Ita. J. Sports Reh. Po.; 2019 ; 6 ; 2 ; 1253 -1294 ISSN 2385-1988 [online] IBSN 007-111-19 - 55 CGI J OAJI :0,101).

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Diagonals Part 9

Learn to assess and train to get an better and faster walking.

The individual with an stroke: “ How we can train the diagonals to create an better result”.

Introduction.

1255 The first individual we want to discuss is mister W.v.G. He had an stroke 6 months ago, he now comes three times an week to train. He discovered that there was something not right when he riding an bicycle . He was not capable to hold the handlebar, he had the feeling that his hand was gone. There he was quit near the hospital, he ride with his bicycle to this hospital. When he try to step down of his bicycle, he collapse through his leg and fell on the floor in front of the hospital . The reaction was fast and with an half hour he lay under the M.R.I. He was treated with thrombolysis and after 24 hours, he was alert and know what he had suffer an stroke and start with the physical therapy. He had already make an inventory what he can and what cannot, he could move his arm and leg but they were very heavy and feel strange. He told us : “ I must look to my leg to see where he was and don't feel the foot and the arm was very difficult to lift and there was no feeling from my elbow”. He had try to sit in the bed but discovered that he was falling to the left side. Therefore he had discovered that he must sit much more to the right, he had than the feeling that he felt to the right but that wasn't correct because he could sit with little support of the not –affected arm. On that point he had the confidence that all will become good. The therapist started with the treatment and the first 5 days all was going good and he stay very confidence, but he found that the recovery of his arm was slow but that was now not so important. The most important was now that he was able to walk and to wash and dress himself with one arm and that he could go to home.

After 10 days the staff of the hospital give the advice to go to an rehabilitation centre because his independency wasn't great enough. This was an great disappointment and he was depressed and angry that the therapist has not work harder with him to obtain that level that he can to home.

He say over that period : “ The therapy were lesser and lesser and therefore he don't reach the right level and I was after the disappointment glad that I can go to the rehabilitation centre there were the knowledge and the skill to get everything good. But there were moment that he touch: “Can I drive again and can I ride on my bicycle to the top of Alpe d'Huez”. When he asked this on nurses and others, they told him that he first must learn to get out of the bed on his own.

Individual after an stroke and medical personal live in different worlds !!

In the rehabilitation was the beginning perfect, but they do also very little on the arm and there was therefore no progression. He get an 4 leg cane and an splint on his foot and he was able after 2-3 months to walk independently and had achieve an independency in washing and dressing, his house was change and after 4 months he could go home and can be treat further in an practice in an nursing home.

This story is always the same and give an impression, what the process of understanding and acceptance is by all person after an stroke and that is by no person is the same. This person was fast and full of courage but see that the progression of his recovery is declined is very difficult , thus therefore is the lower amount of therapy and far more better reason. Every person after an stroke makes an calculation what he maybe can and what not , but the medical world see his stage at that moment and is happy with an independency on that level.

The question : “Can I ride my bicycle up the hill”. Is an normal question, but for the medical personal is that now not an important issue. Also that recovery stops, is for individual after an stroke an very rear phenomena, but the therapist knows that after 72 hour no active abduction of the shoulder and no active extension of the wrist and fingers the prognosis of the arm is poor. Nobody will accept that !!

Analysis of the walking pattern of mister W.v.G.

We going to see how he walks and try to give our ideas about what has changes after the stroke and how much and what causes this.

We investigated always 4 items the tone, perception, alignment and the balance.

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Under **tone** we put;

- Passive tone (spasticity level)
- Active tone (selectivity)
- Power (muscle strength and speed of movement)
- Diagonal.

Under **perception** we think on ;

- Proprioception without muscle
- Proprioception with muscle (muscle spindles)
- Two point discrimination sense
- Vibration sense (gnostic sense)

Under **alignment** we put;

- The length and sliding of the nerves
- The mobility of the joint
- The length of the muscle .

And at least the **balance**;

- Statiek
- One leg standing
- Sit on one buttock in balance.

And in the **klinimetric** section.

What will be the score on the :

- Motricity Index
- Modified Ashworth scale
- Trunk Control test
- Berg balance scale
- The 10 meter walk test
- One leg standing

We show first photos of the front , than from the affected side and at last from the back. Every time seeking to the weak point in the walking pattern . Starting with the loading (heel strike) of the affected leg, than the midstance and then the push off of the affected leg.

Than the swing phase, the initial swing , the mid swing and the terminal swing .

Try to see the whole person because the face speaks also .

**Photo 1****Photo 2**

Photo 1 Heel strike and starting point for load bearing.

Photo 2 The load bearing is almost complete

Photo 3 Mid stance with flexion affected knee

Photo 4 End of the stand phase and start of initial swing

**Photo 3****Photo 4**

What is obvious, is that the loading is done on the inside of the affected foot. That he hold his cane on an special way with two fingers and the thumb on the stick. The face is in the photo 1 and 2 more stressed than in photo 3 and 4. And the tone of the shoulder changes only in photo 3, the shoulder rotated what to the back. And the placing of the cane is in such a way that he can only support, not push and he support heavy. Photo 4 he stand immediately on his not-affected leg and start thus with the initial swing.

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Photo 5

Photo 6

Photo 5. Mid swing

Photo 6. Terminal swing

He lift his leg in the hip there is what pelvis tilt but not much.

The knee remain in same amount of flexion and the foot stay in the same position and because he has an splint on his foot to hold the ankle in an neutral position between dorsal – and plantar flexion. His face !!

And never we see an increase of tone in the arm, the hand remain in the same flexion but this is no end position, thus no increase of tone, further we see on the last photo some increase of flexion of the elbow but this can caused by the flexion of the hip

Another thinking moment, why he lift his not –affected leg on photo 3 so high and why. He cannot placed his not-affected foot further, he passed the affected foot by half an foot. And on photo 6 he stand completely on his not-affected leg and placed on the same time the cane and his affected leg.

**Photo 7.**

The splint in an standing position. This is made from plastic with the closing on the front. Always difficult to get this device independent on, the shoe looks good, but we are afraid that the sole isn't hard and that means that the inversion or the combination plantar flexion and inversion can go on and isn't inhibited enough.

No the elbow is more extended, thus the conclusion must be, that walking gives associated reactions.

(static reaction !)

He stand on his not-affected leg and the affected leg stand somewhat in front of him.

The shoulder and neck line on the affected side is further down.

Photo 7**Photo 8****Photo 9**

Photo 8. Start of the swing phase (initial swing) .

Photo 9. mid swing phase and he has the cane in the air.

Observe: Now are the cane in both phase of the floor, but photo 9 show how hard the not-affected leg is working and what impact that had in the back diagonal to the affected shoulder. The tone of the retractor of the shoulder-blade is increasing and that means that the not-affected leg must work harder. The border of the scapula to the spine goes from the ribcage to the spine by an rotation of the upper trunk (photo 10 gives an detail).

Furthermore the shortening of the affected side is now good to see, but still the pelvis till isn't that much. He makes flexion in the hip but cannot or dare not, set his affected foot far to the front.



Photo 10



Photo 11

Photo 10. Detail of photo 9 and now the medio- rotation of the scapula is great and this can caused an sublux of the glenohumeral joint.

Photo 11. End of the stand phase and now the scapula is more relaxed but still staying to close at the spine .

He don't use the cane in the swing phase but the tone in his affected arm and especially the scapula increased then.

That means that his not-affected leg must work hard and that the selectivity of the shoulder when he is walking, isn't big.

And he cannot place his not-affected foot far in the front and we see an rotation of the affected shoulder to the front after the stand phase is ended and in the swing phase this rotation goes to the back . On photo 3,4 and 11 we see an bending of the upper trunk in the stand phase which can mean that he get an reaction of the buttock muscle by stretch.

But the bending is not very much.



Photo 12

Photo 13

Photo 14

Photo 12. Heel strike

Photo 13. Loading

Photo 14. Midstance

Photo under 15. End stand-phase and start of the swing phase

Photo under 16. Almost terminal swing



Photo 15

Photo 16

The bending of the trunk is present but very little and the most at the end of the stand phase. We see now clearly how far he set is affected foot without support on the cane and how little he can get his not-affected foot to the front.

The heel stand so far we see on the floor. The knee is always an little bit in flexion but on photo 14 mid stance, thus with the highest weight on that leg the knee is almost in extension and then start the trunk bending movement.

His face speaks of high concentration.

Have we discovered the diagonals back and front and are they walking properly ?

Angle of the back diagonal on the affected leg is this greater of smaller than 45° ?

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Last part of the photo reportage, he walks with no support !!



Photo 17

Photo 18

Photo 19

Photo 17. start position , weight on the not- affected leg

Photo 18. terminal swing

Photo 19. heel strike

Under Photo. 20 loading

Under Photo. 21 mid stance

Under Photo. 22 end stand



Photo 20

Photo 21

Photo 22



Photo 23

Photo 24

Photo 25

Photo 23. initial swing

Photo 24. mid swing an little later

Photo 25. terminal swing

Observe his face , what is the moment that he must get concentrated on the best ? The trunk bending movement is almost the same as walking with the cane.

The tone in the arm don't increase very much but there is an increasing too mid stance. And the rotation of the upper trunk to the back is in the swing phase of the affected leg and on lowest at the end of the stand phase of the affected leg.

The upper trunk rotated to the back in the swing and to the front in the stand phase. That means that the tone in the upper trunk is changing and that back and front diagonal are working in the shoulder keypoint.

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Observe the arm movement on the not-affected side, especially when he stand on his affected leg. The arm goes further in abduction and with much more flexion of the elbow , balance ?

Before you read further , take an paper and pencil and write down what you think there is "wrong" and what is the point with most attention!

Think on : Assessmentsee below:

Assessment ;

Tone

- passive tone (spasticity level) - *What you will find in supine position Mass 0-1-1+- 2- 3 -4*
- active tone (selectivity) -*One synergy or two and possibilities to move out of the synergy*
- power (muscle strength and speed of movement) - *Hip extension, knee extension etc.*
- diagonal. - *Can he hold his not-affected leg against resistance , Tentacle ?*

Perception;

- proprioception without muscle more than 11° difference
- proprioception with muscle (muscle spindles) *possible or not.*
- two point discrimination sense *more than 35mm. foot sole*
- vibration sense (gnostic sense) *where he feel the vibration, hallux?*

Alignment;

- the length and sliding of the nerves *involvement of the nerve tissue ?*
- the mobility of the joint *restriction of joints?*
- the length of the muscle . *Loss of sarcomeres ?*

Balance;

- Statiek *Can he give pressure both side on hip and shoulder height ?*
- one leg standing *Left how long , right how long ?*
- sit on one buttock in balance. *On his affected hip ?*

When you have done this.

Look to our score and then we give you the result of the assessment.

Assessment only by seeing the photo's (always dangerous !!) ;

Tone

- Passive tone (spasticity level) Modified Asworth Scale (MAS)

Tone neck normal maybe an little increased in the rotation. Shoulder blade has an high tone but no 4, glenohumeral joint till 90° low tone , elbow tone 2 flexion and extension, wrist and hand/fingers also 2

Trunk tone elongation of the affected side 3

Hip tone low 2, knee end extension high maybe 4, flexion low 2, ankle plantar flexion high 3-4 or there is something with the alignment (alignment problems also maybe in elbow trunk knee and ankle)

– Active tone (selectivity)

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*In his arm only one synergy, only the flexion synergy but with some assistance extension in the elbow is possible and extension in the fingers after stretch stimulation. **BFM (Brunstrom,Fugl,Meyer) 2-3** The leg is about the same, but no reaction in the foot .*

– Power (muscle strength and speed of movement)

Power of the stomach affected side less , shoulder muscle almost nothing , flexion and extension he can make little movement but no power in the arm. Hip extension more than only an stretch reaction in the buttock, but is this an concentric reaction when he walk? Knee extension is weak especially the end and no active plantar flexion or dorsal flexion.

- Diagonal.

He can hold his not-affected leg against little resistance but with increased plantar flexion and with less buttock concentric contraction.

His affected shoulder goes in the bench. But can he makes an Tentacle , we think that he has not the selectivity to do it and that the knee rotated outward but when we facilitated the knee and the foot because he will stretch his knee.

- **Perception;**

- proprioception without muscle more than 11°

In all joint he has more than 11° difference, much more , he need visual control

– proprioception with muscle (muscle spindles)
not possible , we think.

– two point discrimination sense

This is disturbed in the foot sole also under and upper leg .

Also great disturbance in the hand and arm

– vibration sense (gnostic sense)

He feel what at the knee and elbow level.

Alignment;

- the length and sliding of the nerves

He cannot go over his affected hip and that can because by to short nerve tissue, that can also increase the tone of the calf muscle defense muscular.

– the mobility of the joint

There can also an restriction in the mobility of the hip, knee and the ankle be reason that he cannot walk "over" his hip and that he don't stand on his affected leg with an elongation in the trunk but moves with an upper trunk sideways. The movement in the elbow is very poor when he walks but there are difference in difficulty and then we can expected that there were more movement in the elbow –associate reaction. Therefore the idea that the joint is restricted.

– The length of the muscle .

This possibility can also especially in his ankle and elbow and perhaps in his trunk and shoulder blade

Balance;

- Statiek

On hip level he can give the pressure with his not-affected leg but absolutely not with the affected leg,

maybe somewhat when we pull him to the front . On shoulder level the same but pull on the shoulder will give trunk bending first but not much . Sideway from the affected side will be countered by his not-affected leg when the weight is there and sideways not-affected side immediately by his not-affected side and that will be an great pressure !

- One leg standing On his not-affected leg he can do it for more than 30 sec. maybe an problem will come when he closed his eyes. On the affected leg it is not possible for an few second.

– Sit on one buttock in balance.

On his not-affected leg no problem but on his affected leg will this not possible because he cannot cross his legs with the affected leg as base, because he goes not so far sideways with trunk elongation.

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Had you the same ?

Now the complete assessment !

Assessment on the bench with the possibility that we now see what the influence of an greater support area do to him and what the change is in tone and others, because now not all his cognition goes to the walk problems. And see his face , he works very hard, when he walks.

Tone

Passive tone (spasticity level)

Be aware that you make an movement and that the other side muscle inhibit. Tone neck, Flexion end stiff but no restriction, Rotation and lateral flexion to the not-affected side 15° through high tone affected side, rotation and lateral flexion to the affected side restricted 20° hard - joint problem.

Shoulder blade has an high tone but there was movement possible Mas 3, glenohumeral joint till 90° tone was -1 , elbow flexion was possible with high tone 3 , extension was restricted the last 20 -25° tone and hard, there is an joint restriction supination restricted and pronation high tone 3 . Wrist the tone was high 1-2 and in the fingers still 1-2 and there were restriction in all joints (maybe as a result from oedema of the hand.

Trunk tone elongation of the affected side from the lower trunk was restricted and that was not alone tone , tone 3 but there is more, joint or nerve tissue involvement.

Hip tone: Movement toward flexion low tone 1 at the end increasing to 3-4. Movement to adduction low tone 1 but toward abduction 3. Movement toward retroflexion hip by 0° increasing to 2-3. Knee flexion low tone 1, but extension was higher especially the end was very high 3-4 , maybe there is also an problem in the knee, ankle plantar flexion high 2-3 and the alignment is not correct, at the end there is an high resistance without an increase tension of the calf muscle or the Achilles tendon. The toes are very high in tone 3 and stand in claw position.

– Active tone (selectivity)

Head was in every position to hold for him but not in the end-position

In supine position and with assistance of the shoulder he was able to extended his elbow and can relax so far that the elbow bend.

**Photo 26.**

With assistance extension of the elbow is possible and relaxation after that, is also possible. When he start with the extension there is an movement of the thumb out the hand and what from the third finger.

When there was an stimulation of the finger by stretch on the extension muscle of the fingers and the wrist muscle all fingers make extension but he could this only two or three times and then he needed the stimulation.

After treatment on the bench the fingers stay relaxed until go to walk

*In lying position when he try to lifted his arm only flexion of the elbow occur and flexion fingers and more retraction shoulder blade. Thus only and flexion synergy - **BFM 2**. In the leg he could lift his affected leg but with great force of the not-affected leg and there was only flexion 30° with adduction and extension in the knee and plantar flexion of the ankle , variation was not possible - **BFM 2***

– Power (muscle strength and speed of movement)

Power of the stomach , he was capable to make an going- to- sit movement with the whole upper trunk of the bench but the upper trunk goes too far to the not-affected side and then he cannot further. Shoulder: no power. Elbow extension little also in the fingers. The leg , with the hip in maximal flexion he could push his affected leg away with force, but increasing the extension the power was fast lesser. Knee extension was very poo. Plantar flexion not to do for him out of the synergy. But we say in this pushing away movement an small reaction of the dorsal flexor.

- Diagonal.

He can hold his not-affected leg against little resistance but with increased plantar flexion and with no buttock concentric contraction. And his leg goes very fast in endorotation with adduction , therefore he fall to the not-affected side.

His head and both shoulders goes in extension.

Tentacle, when he lift his buttock, he need an assistance on the foot to placed and hold him on the spot. He lift his buttock but he lift all with his not- affected leg, The whole lower trunk goes to the not-affected side. He cannot get his weight on the affected leg with an lower trunk on the wright place. Alignment of the hip is subject for extra investigation.

- Perception;

Proprioception without muscle more than 11°

In all joint he has more than 11° difference, much more, he needs visual control. This was correct but there were in a number of joints, restriction of movement. There is also joint pathology. When he goes to lie on the bench, he was not capable to correct his attitude on the bench, he lay never in the middle always near to the side of the not-affected side, that was his middle of the bench.

Therefore there is little proprioception but also a "wrong" perception picture of his whole body.

– Proprioception with muscle (muscle spindles)

Was not possible because he couldn't move on his own.

– Two-point discrimination sense

Much disturbance in the foot sole but in the under leg also. It was better on the back side of the upper leg and lower trunk.

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Hand and wrist were disturbed but not so great and the arm was also disturbed, but in the greatest disturbance was in the shoulder region.

– Vibration sense (gnostic sense)

Very strange, the hallux he felt, but the ankle not and the knee on the inside good, very good but on the lateral side lesser.

In the hand against the M.C.P. positive, on the tuberositas ulna positive and "good feeling in the elbow caput radius and the epicondyle."

When we did this on bone structure of the shoulder and upper trunk no or very little reaction.

Strange, there are signs that the nerve is affected and gives strange input and perception in the brain.

There are so many reasons to do a good alignment investigation because there are so many restrictions that have a relation with joint problems. **The main problem is a severe perception problem of his body** but when the joints give him not every option then he must make a new picture after the stroke and**strange there is and was never pain.**

- **Alignment;**

- The length and sliding of the nerves

The nerve tissue n.medianus in the affected arm is shortening and is palpable in the front armpit fold (axilla) but this is not very big.

*The S.L.R. is left and right equal and possible till 70° and the end is not very hard. The n.ischiadicus is palpable in the knee cavity, but Knee Prone Bending was well restricted and this was the **first time he complains about pain in an area up the knee.** That means that the n.femoralis can be the cause of the problems to make a big step. Also was the tension on the n.obturatorius great and that gives a restriction in the abduction movement of the hip.*

– The mobility of the joint

Neck, there was a restriction between vertebrae that makes a lateroflexion and rotation difficult, traction technique gave some improvement. Trunk, lower trunk there was little problem with lateroflexion but not much. Hip, there were problems in the extension, abduction and what endorotation in the joint. This restriction was not very hard but together with the nerve tissue problems could this be the cause that he cannot walk with an elongation of the lower trunk and moves his affected hip to the correct place. Traction with Mulligan technique shows us that there was a good possibility to change that. Knee, the end extension of the knee was restricted not by nerve tissue or muscle tone but by the joint, with Mulligan technique this can be improved.

The ankle had through the inversion not the proper movement of the talus between the furca malleoli and that was not totally correct by the splint. The tone was high and when he walks one of the reasons

that he cannot set his not-affected foot further to the front, was through the high tone that created an striker foot. We treat him an week in plaster to have an good foot-position and we can evaluated what happen when the hip and knee were less restricted.

The elbow, was looked when he walks because the joint stand in the wrong position and when he sit down or lie down the tone decreased and the elbow un –locked. We hope that when he walks better the tone and the locking will decrease. The treatment of the arm now especially in sit and lying position.

– The length of the muscle .

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Not really in the ankle , not in his elbow, but positive in the shoulder blade but that is not possible to change with plaster technique, therefore was the treatment long inhibition technique and keep the shoulder blade move to front by support exercises for the arms in the front (diagonals)

Balance; (This part was the only part that we had almost correct)

- Statiek

On hip level he can give the pressure with his not-affected leg but absolutely not with the affected leg. An little bit better when we pull him to the front . On shoulder level the same but pull on the shoulder will give trunk bending but not much. Sideway from the affected side will be countered by his not-affected leg when the weight is there and sideways not-affected side immediately by his not-affected side and that will be an great pressure be that he build up !

– One leg standing *On his not-affected leg he can do it for more than 30 sec. problem will come when he closed his eyes. On the affected leg it is not possible for an few second. He was even not capable to closed the feet by himself.*

– Sit on one buttock in balance.

On his not-affected leg no problem but on his affected leg not possible because he cannot cross his legs with the affected as base because he goes not so far sideways with trunk elongation.

Conclusion ; That the perception is very poor is true but that the tone was the greatest problem wasn't true. But the combination of poor perception and high tone (poor synergy) has great influence on the mobility of joint and nerves. What cause this restriction isn't clear, but they all were there after the stroke. To treat all this difficulties is important and had an tremendous influence. After the treatment of the alignment, the task-specific resistance treatment for the buttock and knee extensor gave now the reaction that there wasn't before. Within 4 months we did the test with the plaster on the ankle, because now the problems in the lower trunk /hip and knee was much lesser and through the plaster, we can placed the ankle in the best position and now he could set much better steps with the not-affected foot through the better movement over the affected leg.



Photo 27 /28



Photo 29/30

Second case , but shorter on paper . First the photos and then it is **up to you to make an assessment**. We give on the end the assessment, that we have carry out before starting the treatment. Again four items have **our special attention** :

- Tone**: passive , active selectivity , power and diagonals.
- **Perception**: proprioception without and with muscle influence, two point discrimination and vibration.
- **Alignment**: Nerve tissue, joint and muscle length

Photo 27

Walking (loading) pattern before the treatment, combined the joint and nerve tissue mobilization with task-specific resistance treatment and an learning program with an lot of variation as repetition.

Photo 28**After the treatment:**

Mid stance , alignment of the affected hip/trunk is improved and he used the cane not only for support but also to push and stimulated the back diagonal and now with the buttock muscle.

Photo 29, the step with the not-affected foot is greater and he still improved this because he used the push –cane technique.

And look to his face , he look after setting his not-affected foot on the floor up instead of always down.

Photo 30 closing the feet , he can do it and after an few attempt the first second one leg standing were there .

-- **Balance:** Statiek , one leg standing and sit on one buttock with the not-affected leg cross over. Mister T. D. old football player in the Dutch highest division. He is 90 years old and had an stroke now eight years ago and ask for more security in- and outside and more possibilities in his arm. In this assessment only the walking part.

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Photo 31

Standing from a bench, look to weight bearing on the two legs and you can see that on the way he held his arms. The not-affected arm must be in that area to secure the balance .

Further it is always very important to look to his face and what he do with his face. The expression is important but also the direction in which he is looking, not far for his feet but the area of his foot.

Start walking



Photo 32 a/b

Photo 32a. End of the stand phase on the affected leg , push off. ?.

Photo 32b . Start with the swing phase –initial swing . Look what movement the not-affected arm makes. Diagonal effect !!



Photo 33

Photo 34

Photo 33 Terminal swing and start of the loading phase .

Photo 34 Loading phase and look to the attitude of the trunk. Arm position.

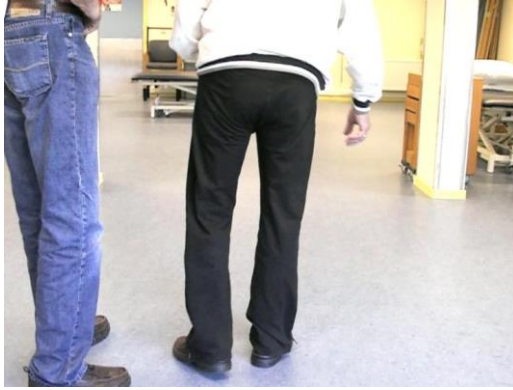


Photo 35



Photo 36



Photo 37



Photo 38

Photo 35 Initial swing with the hand no longer closed. Look to the affected arm and see if you see movement or tone increase.

Photo 36 mid swing, he wears a simple splint.

Photo 37 Terminal swing

Photo 38 start with loading on the affected leg.



Photo 40 End of the stand phase and on this photo there very much to see and to assessed.

Your assessment . What you think after seeing the photos and what you want to invest on the bench. The complete assessment will follow now, therefore what is your assessment ?

Assessment on the bench.

--**Tone** : Passive on the bench

Neck no tone increase but an end restriction of the right rotation /lateral flexion. Trunk no tone increase and no restriction.

Shoulder blade: Movement to protraction tone 2 and end hard, glenohumeral all movement direction tone -1, elbow flexion tone 1, extension tone 2, wrist tone 2 all directions, fingers tone 1 toward flexion and 2 toward extension. Hip extension 0 - -1, flexion 0/-1 exorotation -1 , endorotation 1, abduction 1 and adduction -1 Knee extension 0-1 , plantar flexion 1

– **Tone:** Active selectivity on the bench. *Placing of the neck is possible in all direction and he can hold the situation immediately even with an little resistance (“BFM 5”)*

The trunk there was always an deviation to the affected side and coming to an long sit was only possible with support of his unaffected arm.

Shoulder no possibility to hold the arm at 90° in the air but in 120° he can hold him(an eccentric action of the pectoralis of the affected side). In this position he was able to extend his elbow and let go and make flexion but when he try to extend till the end there was more tone in the adductor of the shoulder and the arm fall down. In sit with the trunk bended in an upper trunk forward he could make extension in the elbow and when he try to lift the arm, a few degrees but with the extension in the elbow . That means that he can change from one synergy to another and even had some more selectivity but still **BFM 3**.

Lying on the back and with the extension of the elbow with little force previous on the fingers, he could open the fingers a little bit, in sit position also but when he try to create more the fingers flex. (**BFM 3+**)

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placing and holding in **two position**: - **one** with the hip, knee and foot in 90° flexion and the - **other** position hip 30° flexion , knee total in extension and the foot in 90° dorsal flexion. Placing to position **one** was no resistance but the leg was too heavy and that means that he couldn't do it on his own. Hold that position was not possible in the hip exorotation/ abduction and more flexion in the hip, in the knee more flexion only the **dorsal flexion** stay on the same spot. Position **two** , the hip go to more flexion because on 30° he couldn't hold the leg from the bench , the knee couldn't be hold in full extension. Direct there was flexion and also the foot hold the dorsal flexion not. Still there is selectivity but the heaviness of the leg or the lack on power in the lower trunk and leg, makes that he couldn't hold his leg.

- **Tone** , power;

Head /neck was there no difference between the affected side and the not- affected side but the reaction of the upper trunk of the affected side was different. Now the shoulder lift up to elevation. The trunk on the front side was on the affected side much lesser in power of muscle than the not-affected side and the umbilicus stand always to the not- affected side. The power of the trunk in extension was in the upper and lower trunk on the affected side lesser than on the not-affected side. The shoulder blade there was power for retraction and protraction but the power for protraction was poor. **Different between power and tone**: Power ask for an active movement, an movement with speed and strength. In the glenohumeral joint was no power at all. Elbow there was active movement by flexion and extension but less power.

In wrist and fingers was an active movement with low speed against little resistance possible, but only in sit or lying position not when he walk . That means that tone somewhat increase when he walk and that he must walk with an lot of cognition extra.

In his leg flexion of the hip was active possible but the hip drop in abduction and exorotation and that could he brake only a little bit. Active extension was there , good with maximal flexion of the hip but the power decreased rapid when the hip move to more extension.

Knee extension and flexion active possible , resistance against flexion/extension was possible but little and not total till the end. Dorsal flexion possible against resistance and plantar extension also. In the foot was the most power of the entire leg. But the power was limited **MRC 3-4** He has an lot of active movement possibilities, that would give him BFM 4-5 but when he must coop with his total arm or leg than was the shoulder and the hip (The Keypoints) very poor in stabilization active and with power. Therefore was selectivity only **BFM 3**

- **Tone:** diagonals.

Lying on his back he lift his not-affected leg in the air but the action of the affected leg was exorotation, no endorotation and the exorotation was not active. The affected leg drop outward and he grasp the edge of the bench because he rotated to the not-affected side than he created an stability and we felt not much m.gluteus maximus, no much pressure under the heel and very much plantar flexion. Resistance to the not-affected leg was possible but very little.

*An tentacle was possible **with support** because when he lift his buttock he did it mostly with the not-affected side and when he shift his weight to the affected side his level of lifting decrease and when the not-affected foot came off the bench, the affected hip collapsed in exorotation/abduction. When he get assistance to hold the hip in the correct position, he was able to get his buttock loss of the bench and his not-affected leg in the air, but never was the height equal with what his not-affected buttock could do.*

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Lying on his affected side (side lying position), he was capable to lift his not affected leg, but when there was resistance than it became fast too much. An the movement of the not –affected leg to the front was very poor, because the keypoint hip and shoulder couldn't give the stability , to the back better but now was his not-affected arm far to the front. By this movement there were active movements of his affected arm, especially elbow but also his hand/fingers and his foot. Thus in this position with great effort there was more possible to create active movement than in stand of walking and this will be an good position to exercise his arm and leg to an higher level.

What had you ?

Tone, From -1 to an max. of 2 , selectivity poor but more active possibilities distal but with poor power

Now perception . What you think ?

-- **Perception:** proprioception without muscle influence.

Leg, problem here was that when he move his not-affected leg, he build up tone in his affected leg. Therefore we start in 90° flexion with both legs and in that position we start the test. And the foot was good often less than 11° also the toe (an little bit more than 4-5°), knee was more than 11° and also the hip, but often not more than 4-5 ° difference(above the 11°), but the exorotation he don't feel , 15° exorotation give no reaction.

*The arm was very poor in the shoulder every time much more than 11°, in the elbow and hand fingers was it always more than 11° or 5°(fingers) but not so much as in the shoulder. When the test was executed with **passive movement**- the investigator moves passive his affected leg and he has to follow with the not-affected leg, he score better except the shoulder and the exorotation of the affected hip.*

At the end he must try visual to correct the position of arm/elbow/hand and leg/knee/foot that was very good except the exorotation of the hip and the rotation in the shoulder.

Perception: proprioception with muscle influence.

Now he may use movement of the affected leg to feel what the stand of the joint where. (This is of course never an good test therefore we need an vibration apparatus but that wasn't there). To use the muscles, we expected that he now get more information and with this performed better in the feeling

van the position of the arm/etc. and leg/etc. The result where must better but the hip exorotation not and the shoulder was equal with no muscle activity.

Perception: two point discrimination.

In the foot and especially the foot sole was this more than 35mm and also in the lower leg. In the hand was this also the case but he felt the base of the wrist and the MCP as two different point but the distance is too much.

Also on the underarm and under leg, where the distance to great , that means that he don't feel where the sleeve of his shirt exactly was, when he put him on, Therefore he must always correct it visual and that ask for more attention –cognition !

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Perception: vibration.

*Was disturb but on all bone point in foot, ankle and knee he feel the vibration but not so clear as on the not-affected side and at the height of the trochanter major, he gave on that it was almost equal. In the hand and elbow the same only the edge of the acromion was not felt. **His shoulder fail by al perception test !!***

-- **Alignment:** Nerve tissue. *The nerve tissue where not very involved , the slump was no problem , the leg test also, only the n.medianus in the arm was lesser than the other side and was palpable under the muscle pectoralis tendon. His shoulder was sublux and when he walks without an support he often hold that arm because it was so heavy . He had no pain and walking with an cane he used the pocket of his jacket.*

Alignment: joint.

The shoulder was in an sublux stand. But no pain.

ù



Picture 1

Photo 41



Picture 1. Rö- photo of the sublux

Photo 41. You see the characteristics of the form of the shoulder when there is an sublux.

*In the wrist was at the end stiffness more than on the not-affected side, also in the fingers, the elbow and particularly the supination, in the shoulder was no resistance. Only by movement, was need for an good movement-facilitation of the scapula and gleno humeral joint. There was an restriction in the steno-clavicular joint. The scapula itself seem more an tone- problem and maybe muscle length. The foot/ankle no problems only what stiffness in his toes, knee no problem but the hip was **hyper mobile**, especially the exorotation, there was more than 15° more rotation than on the not-affected side and there was also almost no end stiffness.*

When we exorotated his good leg, the tone of the endorotator increased at the end of the movement to prevent damage, that was almost not present on the affected side and he gave also by the end pain and still we felt very little resistance.

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This makes his hip instable and explain the impossibility of an tentacle without assistance and makes an great step with the not-affected leg impossible. Because we need in the affected hip an extension with endorotation and that muscle isn't working.

Alignment: muscle length.

Only the muscle (the retractor of the shoulder blade) but the only treatment is stretch and inhibition of the tone and Botox, but then must the protractor be available, That was the case but his age gave that they found here no indication.

Expected that the perception was of this level ? And that one of the greatest problems was the hyper- exorotation in his hip.

-- **Balance:** Statiek. – on hip level.

Pressure on hip height to the back gave an very bad reaction also from the not-affected site. Never was there an continue pressure to the front but he tried by push movement to build some pressure but cannot hold him the whole time. Often we see that with person, that has another perception of his body because walking with the upper trunk bended will created in the brain an new total perception scheme of the body. We see this by persons walking with an rollator frame but also by person with an lumbar stenosis. That means that pressure on the front give an discrepant between their perception scheme and the reality and they will stop with pushing against the pressure because they feel that they will fall, in reality they have more space. There was well an reaction of both feet, only the power of the dorsal flexor of the affected foot was poor. Pressure of our foot on his not-affected foot gave an normal reaction, but that action wasn't present on the affected side. The upper trunk react mostly from the not-affected side and the affected side came very slow.

Pulling on hip height to the front gave on the not-affected side immediately an strong reaction, on the affected side poor but there was some activity in the m.gluteus maximus and the heel of both feet came from the floor. On the affected side very little, but there was "light" between the heel and the floor. The upper trunk rotated, first the trunk bended but then the extension started but first in the not-affected side and the affected side stay behind. We say an flexion in his affected elbow, sign of an static reaction- associate reaction. Thus it was very difficult to counter the pull! Sideways pressure, pressure against the affected side was only countered by the not affected side, pressure against the not-affected side was much too fast countered and with an firm movement of the upper trunk sideways, that will lead to an abduction of the affected leg and never the possibility of crossing the affected leg over the not affected leg. In the feet were on the not-affected side an perfect reaction, on the affected side no reaction.

**Photo 42**

Push sideways on pelvis level give an firm resistance but almost all with an firm bending of the upper trunk and that gives an abduction movement in the affected leg.

Also the reaction of the upper trunk is too big, because when the therapist release suddenly the pressure he will fall to the not-affected side.

Photo 42

On shoulder level :

Pressure against the shoulder gave an firm reaction in the not-affected side , less in the affected side and now the pressure was continued by bending the upper trunk and when the pressure suddenly was gone he fell to the front in my arms. There were no reaction to counter the movement in the trunk , only the not-affected side stand on the toes. Pulling the upper trunk to the front gave no resistance only bending of the upper trunk and that was very much, than there was an reaction in the upper trunk and feel we also action in the buttock muscle but the difference in the not-affected side compared with the affected side was great. After 4 rehearsal he wasn't capable to improve that. Sideways , was the same reaction as with the pressure on hip height.

Bending of the upper trunk seem to have alter the perception of his body but his system to create extension to brace an fall to the front was weak.

Balance: one leg standing.

Standing on his not-affected leg was very good, he could this with the eyes closed for 15 sec with eyes open he was capable for more than 30 sec. but always with the therapist in the neighborhood. On his affected leg was it not possible, with support he can lift his leg, but cannot hold him. There was an shift of the pelvis and that shift was great, see photo 40. That is thus they reason that he placed his not affected foot so fast and with the toes first on the ground.

Balance: sit on one buttock with the not-affected leg cross over. *With facilitation this was possible but there was no change that he hold this position without assistance. The action in his affected hip was not present, there was no exorotation and no muscle activity in buttock to build an frame on which the diagonal could build up their structure.*

What were the most important phenomena that we found ? -

Tone low, selectivity poor, because of lack of power. Diagonal structure was poor especially the back diagonal from the not-affected side to the affected side was not capable to give stability. Therefore much must be done by the not-affected leg and that gives an restriction in the scapula. --

Perception was disturbed but not extreme there were information from the distal part to the brain and the brain recognize that. -

- **Alignment** was maybe the most important factor that the rehabilitation has stopped because the hyper mobility of the hip and the lack of muscle power together makes load on the affected leg very difficult.

- **Balance** here was the very great difference what the not-affected leg can do in comparison with the affected side. The change in perception of his body position in stand over the past 8 years will be here the reason for this problem. But when we feel the power that this man had with his age on the not-affected side, he was quite strong but the difference with the affected side was very great.

Treatment program:

There were concentric contraction, but he walk with an eccentric contraction, now 8 years and we know that eccentric contraction will damaged the muscle. And often it was not an eccentric contraction but an stretch reaction appear also when he was tired. Often in his home situation, he fall almost because he want to set an step without support and then there was an total collapse of his hip. And the alignment of the hip was so poor by losing the extension but also the endorotator power. His hip turn by every step outward and he must rotated with his upper trunk to brace that movement. But there were moment that an concentric contraction was possible and the muscle of our body are the most plasticity structure that we have.

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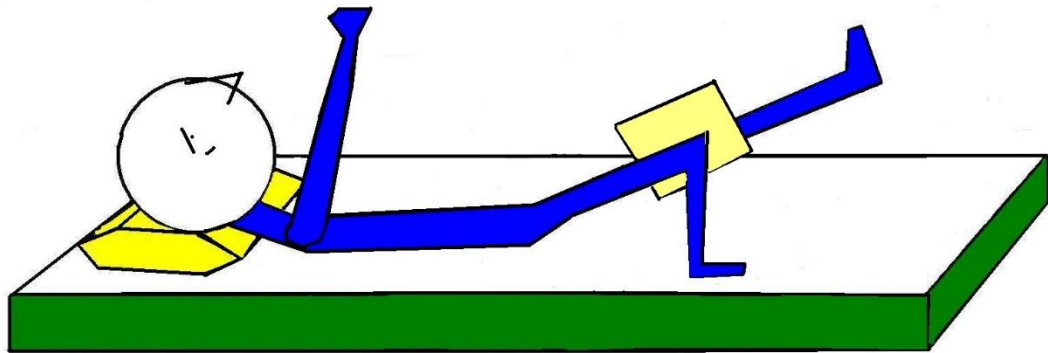
1. An program with task specific resistance therapy to create more muscle power especially around the hip and extension in the knee is the only way to create more power.
2. And we must learn him, how he can use the force, that he was building up in his walking pattern to get more speed in his walking. Of course will we try his balance and perception of his balance to improve by using differential learning method.

We started with 3 exercises for creating more power and make it an program of 75% R.M. Repetition Maximum

1. Tentacle.

The tentacle without assistance was not possible but the greatest problem was to decrease the exorotation and abduction in his affected hip, caused through the hyper mobility of the hip. Restoration of the power of the endorotator muscle will be not possible, therefore were this muscle to far away and the muscle had an extreme length through much more sarcomeres than normal. Therefore we want to try to create more adductor muscle. Thus the first goal was – holding the legs together and try to hold the pillow between the knee and move the not-affected leg over the bench without lifting , lifting will be the end goal.

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Picture 2.

Here we see the end goal. Hold the pillow between the legs and lift the not-affected leg by stretching the knee

2.Side lying. Starting with stable lying om the affected side and then with movement of the upper leg and at the end with resistance against the upper(not-affected) leg.



Photo 43.

Photo 43.

On the “not-affected” we have connect an sand bag that ask from him almost 80% of his R.M. , after 4 attempts the movement is lesser high and early down. With so much weight we try to create hypertrophy in the abductor muscle and when we move to the front and back also in the keypoint of the affected hip. The possibility of the not-affected leg to go in the air is dependent of the stability power of the affected leg.

3. Stand .

We choose for an restriction of the swing phase of the not-affected and that in mid swing and with an lift up thus with knee flexion. This choose was made because than there was an concentric action in

the buttock. After weeks of training we could go to an swing phase to the front and could create an greater step with power of the affected buttock but always with the support of the not-affected arm/hand on an chair rest.

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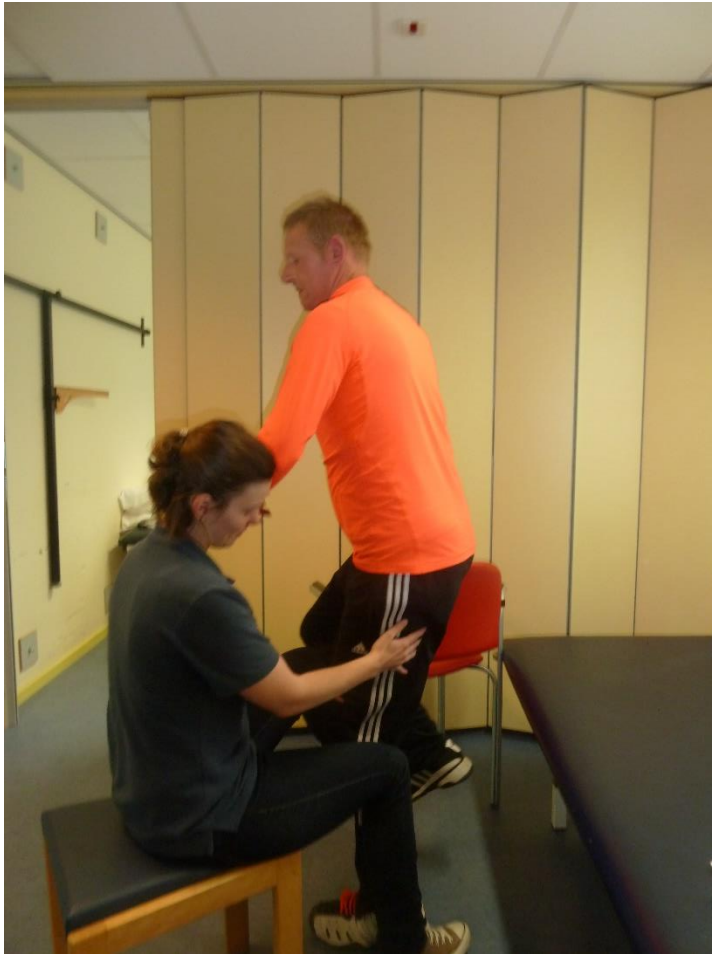


Photo 44.

Supporting on the chair rest he try to swing and lift his not-affected leg to the front but especially to an higher height . This movement ask much more from the extensor muscle of the affected leg and in this case this was the only possibility to create an concentric contraction and created an stimulus for the affected leg muscle to increase the coordination and the power of the muscles in the diagonal pattern.

That means that to learn to use this power, he must than created an back diagonal and that ask for an fixed point of the not-affected arm /hand !! Than he must create this movement with an cane and so learn to use the increased power in his hip- and knee extension.

The power increased , every week there was an possibility to give more resistance , long we increased the resistance because we need much more power.

We started with the walking learning program at some as possible and we control that in that new walking pattern was an concentric m. gluteus maximus activity.

The first reaction we achieve with walking along an high bench and walking along the support in the corridor. He walk on A.D.L – level with an special rollator frame that makes his diagonal longer but created no activity in his buttock, therefore we put in the rollator frame some weight and the concentric activity was present.

After an several weeks, the best reaction was present when he push away an chair without stopping the movement and after that with weight on the seating area of the chair.



Photo 45

Photo 45.

Walking and pushing an heavy chair, he was capable now to walk without through he could walk in an fast time to the bench and the placement of the not-affected foot was now better.

This was possible at least with an rollator frame, an nordic walking stick and his cane and his speed was increased from 25 sec over 10 meter (1.44 km/h) to 16 sec over 10 meter(2.25 km/h) and that was also possible outdoor when the road was good.

But **without** an support the speed fall down, lower than 25 sec over 10 meter and that was difficult to accept for him because in his home he walk with no support, because he want to carry something but then he was very slow and instable. In the store behind the shopping trolley he was so fast. Further walking in his home with an support was possible but only the cane of the Nordic walking stick than he was fast but cannot take something with him. The rollator frame was no option, therefore was his home to small and to many difficult corners.

Why was walking with no support so bad ?

It remain impossible for him to activated the back diagonal without an support. An higher and faster swing movement of his not-affected arm to the back had no influence on the remains of the back diagonal and especially the activation of the buttock muscle was lost.

The keypoint of the affected hip stay without an support on the not-affected side passive and the movement of the hip sideways(Trendelenburg) and the elongation of the buttock muscle by bending the trunk stay necessary to give some muscle action.

Without an elongation and fixed point on the floor on the not-affected side, there was no concentric activity in his keypoint hip on the affected side.

This was in this stage not possible, that means that when muscle are too long active in eccentric, that muscle change (sarcomeres) and that the quality of the muscle is decreased (Choi). That learns us that the program task-specific resistance treatment must start as fast as possible, before patient learn to use the eccentric of stretch technique to evoke an contraction in the buttock as part of the diagonal and that differential motor learning is very important to implement that technique in their walking abilities.

But the elongation and the reaction in the endorotator muscle of the hip can occur in the first day when the individual is lying in the hospital(399). The affected leg lies often in extreme exorotation and that will give an stretch on this muscle. Is this muscle active, this will give pain and the leg will flex with often high tone in knee flexor. But when there is no tone and also no pain there will be no reaction in this muscle and this muscle will lose his function.

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That means that the movement over the affected hip isn't possible and stops when the exorotation of the hip joint must change in an endorotation. That means that the movement over the hip isn't possible anymore and that there will be no push-off and therefore also no great step with the not-affected leg. With an support in his not-affected hand, he was able to activated more of the diagonal through the affected hip included the keypoint and create and better movement over the hip but when that support was gone, this activation was not possible.

Alignment loss was here the greatest problem !!

Correction in the diagonal articles before this, about eccentric and concentric contractions.

Eccentric and concentric contractions.

Literature has given the concentric contraction an higher brain level than the eccentric contraction. The work of Dr. Lieber was one of the first, that mentioned this difference, but investigated the agonist antagonist complex sec. He say that the activity in the brain was heavier by concentric contractions than eccentric.

The concentric contraction ask according to Dr.Lieber more because the movement is against gravity and that isn't by eccentric. But there is very little investigation that invest what the antagonist - controlling - function do in the brain.

In early parts of this group of articles about diagonal the theory of Dr.Lieber stand central but there are reasons enough to assume that this isn't the whole true.

Fang and others have investigated this in 2001 and by young people, therefore we don't know what this is by older people. But one of the first assumption of this investigation is that gravity will ask more eccentric action than concentric. That isn't true by movements against but positive in standing than is an eccentric contraction of the attitude muscles economic better than concentric. Every attitude with support ask for an eccentric or isometric contraction.

The reason according Fang are that eccentric has more power, endurance and selectivity as concentric. Power is by an eccentric contraction not only muscle power but also using of energy in the not-contractile structures which make the power in total, much bigger !

Fang investigated the action of an contraction of an group of muscle (that means an union that covers an joint but also muscle pattern as the diagonals only regrettable not the diagonals sec. and say that the action is different .

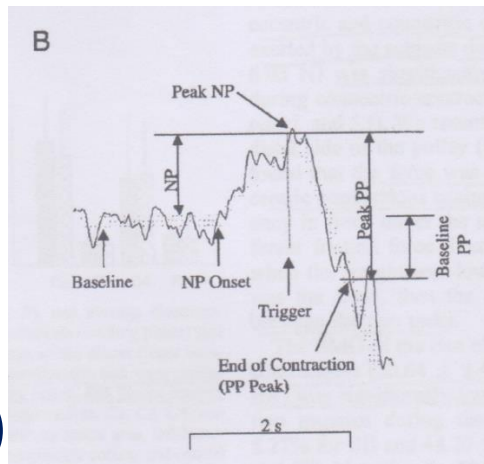


Figure 1.

Contraction of an muscle.

But before this contraction we see an NP and at the end we see an PP.

This pre and post contraction action is an action of structures in the brain and that are control action that have more influence on the eccentric centre than the concentric centre. NP = Negative potential and related with planning preparation.

PP = Positive potential - feedback to the sensory system

Looking in the brain we see that always the eccentric activity gives an higher but often also an early resposn than the concentric activity. The MRCP – Movement Related Cortical potential is the NP (Negative Potential) and the PP (positive Potentia) by an eccentric contraction faster than this values by an concentric reaction .

And when we look to all reaction in the brain than we see again and again, that the eccentric activity is faster than the concentric reaction.

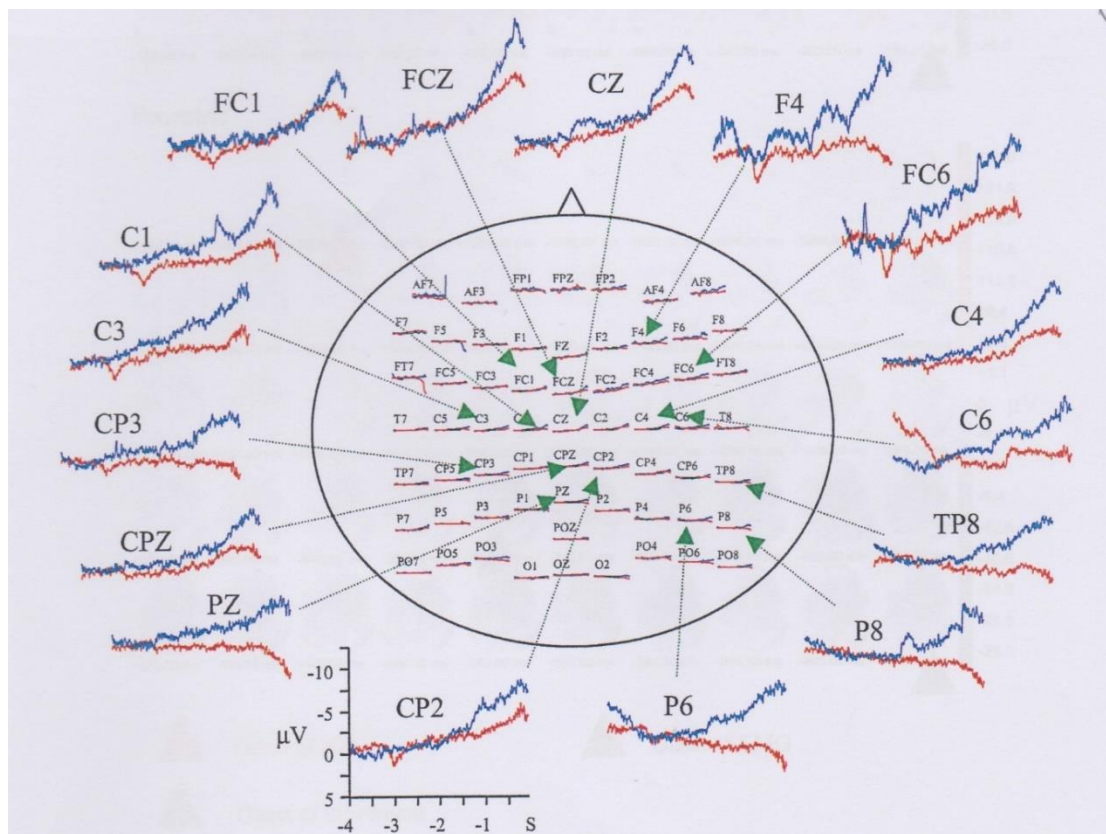


Figure 2.

Figure 2. The blue line is the eccentric action and the red one is the concentric action. In all this moments between muscle and brain is every time the eccentric activity stronger than the concentric reaction . For more information read this article of Fang.

In the lab. was the person set in an chair and his arm was fixated in 90° abduction. The contraction that was measured was of the flexion and extension of the elbow and that especially the eccentric and concentric contraction .

In this position it is difficult to measure full power possibilities because never will the power of eccentric contraction against the gravity be comparable with concentric.

Therefore will the difference between the power in an movement against the gravity (concentric) and isometric and eccentric be comparable. And that difference is beyond any doubt more eccentric than concentric.

But when the gravity isn't working on the situation because the attitude is always so that the gravity is the same for both contractions than will the power possibilities of an muscle be different and that is the case in this study. This gives an picture what the activity in the nerve system when the activity is concentric or eccentric. The NP and PP potential before the contraction and after the contraction are important because which of the two inform the higher system first. Figure 2 give clear that the eccentric system gives his signal faster than the concentric system. Or otherwise the brain has an faster need for the potentials of the eccentric contraction than the concentric system and the only explanation can be that this is needed because of the selectivity at his highest level be controlled.

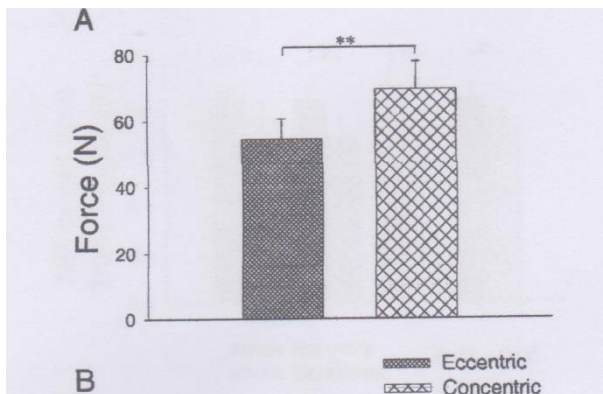


Figure 3

Figure 3.

The force in the attitude that the arm is placed, makes this result in power (Newton) possible. And the difference between the eccentric power and the concentric power is great and that is for all muscle involved with the elbow joint. BB Biceps b, BR Brachioradialis, TB triceps Brachii and DL Deltoid muscle .

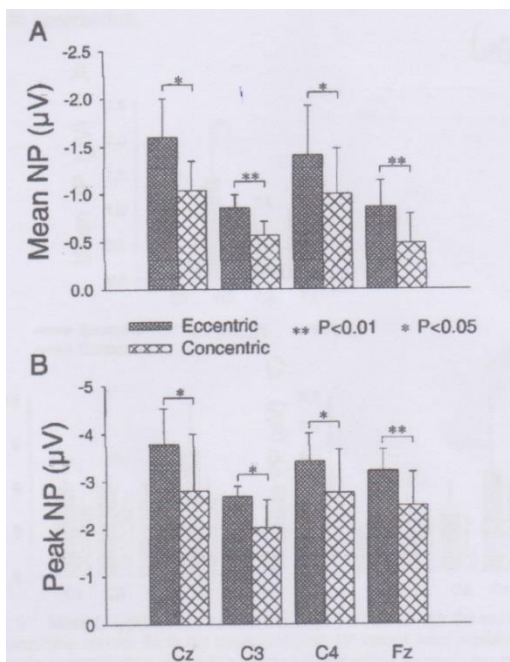


Figure 4

Figure 4.

This gives an picture of the activity in the brain when there is an eccentric or concentric contraction.

Here is measured the NP and PP and the greatness of the reaction. This through measurement of the potential.

That is greater for all places in the brain but also faster for the eccentric NP /PP and that means that brain ask for an early information.

Cz = Supplementary motor area.

C3 = Left hemisphere sensorimotor cortex.

C4= right hemisphere sensorimotor cortex.

Fz = central prefrontal cortex.

Always the eccentric potential were higher.

This information makes the understanding of the muscle pattern not simple. But the knowledge what the contribution of the brain is by muscle pattern is still very small and every investigation will change our knowledge.

But there is an great problem when only healthy subjects are investigated because we are working with older people (healthy but older) and older people with an neurological disease. That means that the control of the brain is damaged and that the brain must work with an lower level of control. And how we can teach the brain to create an higher level of control.

Hypothesis.

When the brain is damaged than the activity of the brain on the agonist antagonist system will be alter. Concentric is difficult because the power of the muscle is decreased and the control mechanism of the eccentric control isn't there. When the concentric is too difficult (think on the synergy performance and the angle of the diagonals) an muscle as the m. gluteus maximus cannot be active so. But the question we now ask ourselves is an eccentric contraction on the level we see above possible ??

We presumed that this is not the case and that means that the contraction that we feel is an contraction not on an eccentric level – as an control of the brain – but on action of an motor /spine unit level. The stretch on the muscle evokes an contraction in the buttock muscle but that contraction is an spine level and only possible when there is an stretch on the muscle and their spindle.

We have read that eccentric contraction especially by older and neurological individuals is harmful. This can give damage of the muscle and that is make visible by echography.

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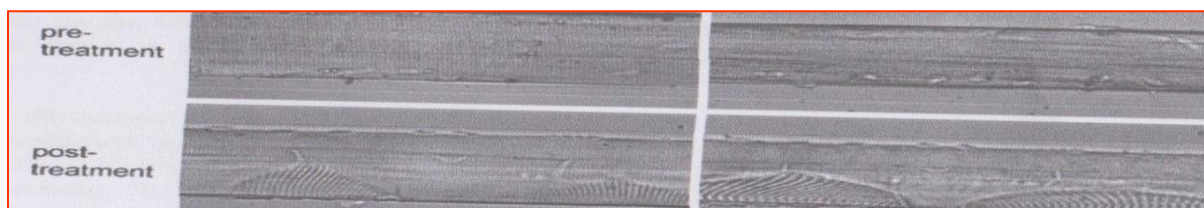


Photo 46

Photo 46.

Photo of muscle pre-treatment and post -treatment, The treatment were strengthening with eccentric contraction. In the post-treatment on the bottom of the picture there are waves visible that are the injury - part of the same muscle .

This article was an investigation by older people and there was in muscle – fiber this visible and there was no neurological disease. Of course the brain isn't be so well as by young people but the eccentric control can be the same, still this injury occur .

Is this because this people need more concentric to restore the balance or is there an decrease in the brain control ?

We have on this moment to little knowledge to give an answer !!

End part 9

The next parts we will discussed :

Contractures -Swallowing -Pusher-syndrome and Treatment of the paretic arm /hand.

Ita. J. Sports Reh. Po.

Italian Journal of
Sports Rehabilitation and Posturology

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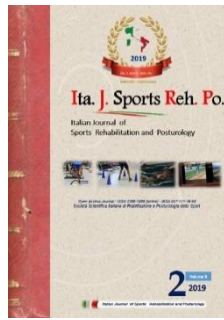
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