Newsletter IPNFA research committee

The third newsletter……, I remember how I wrote the last time: "oh this is a challenge, how and from where will we get material?" and now we can present even 3 topics from our own ranks. Besides these 3 topics I scanned the world of science a little bit and we filled the empty spaces with some interesting issues. We would appreciate it, when other IPNFA members (also associate members) would send in some contribution to this nice medium.
On behalf of the research committee, I wish a joyful reading. Fred.

Direct access is a hot topic amongst PT's.[1] One of the primary concerns about physiotherapists as first line practitioners is patient safety. This realistic concern has been used as a political obstacle for those who oppose physiotherapist autonomy and direct access. The opposition to direct access is variable, but mainly comes down to **tradition** and **economics.** Over the past decade, there has been a growing body of research examining the quality in diagnostic precision of physiotherapists and the impact of direct access on healthcare utilization and costs. The results are very promising, and the evidence is growing that physiotherapists can play a role as first line practitioners. The roots of direct access to physical therapy can be found in Australia in 1976. Prue Galley, an Australian Physiotherapist, is credited for making the push to recognize physiotherapist's as first line practitioners. He is quoted as saying: "…have we as physiotherapists, the knowledge, the courage, the will and the vision, to take this independent step, knowing full well that it will involve increased responsibility, greater dedication and self-discipline from us all?"[2] In 1978, the United Kingdom joined in and over the past 3 decades more and more countries have initiated direct access legislation, like the Netherlands in 2006.[3] According to American Physical Therapy Association (APTA) statistics, 46 states, plus the District of Columbia, currently have some form of direct access.[4] A study conducted by Childs et al examined "…if Physiotherapist's have the requisite knowledge necessary to manage musculoskeletal conditions?" The study used a standardized examination which was used to assess the knowledge of musculoskeletal conditions for medical students, physician interns, and residents. The results demonstrated that experienced Physiotherapist's had higher levels of knowledge of musculoskeletal conditions than all of the other medical groups examined except orthopedists. The study also examined non-licensed physiotherapy students and they also demonstrated higher proficiency than other medical groups, but were lower than the experienced Physiotherapist's and orthopedists.[5] Additional research regarding clinical diagnostic accuracy (CDA) for musculoskeletal conditions was conducted between Physiotherapists, orthopedic surgeons, and non-orthopedic providers (family practice, ER physicians, physician assistants, nurse practitioners etc). The results concluded that the CDA for Physiotherapists was 74.5%. This is compared to 80.8% for orthopedic surgeons and 35.4% for non-orthopedic physicians[6.] Further development of our profession and the drive toward autonomous practice and full, unrestricted direct access will continue to be a big issue with lot's of discussion. It is something that all Physiotherapist's need to support and strive for, regardless of their practice setting. We should "own" the profession of physiotherapy. Until now we can conclude that health care use during physiotherapy episodes was lower for those who self-referred, after adjusting for key variables. What does this mean to our PNF curriculum we should ask our self's, is this topic concerning us? The set up of a treatment should be based upon a qualified diagnostic evaluation or assessment of our patients. Should there be a place for valid diagnostic tools in our course curriculum? I hope for an interesting discussion within our IPNFA.

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HEMIPLEGIC HAND, abstract (from Fred)

Introduction. Contracture formation and loss of mobility of the hand and loss of activities and participation, because of relative immobilization of the hemiplegic arm is frequently reported in patients after stroke. From literature it is evident that recovery of hand function (dexterity) in patients after stroke is poor. The clinical issue is that functionality of the hemiplegic hand, like it appears in patients after stroke, is hard to treat. Manual therapy techniques are used in the hand rehabilitation in musculoskelatal setting. This study addresses the question whether manual therapy techniques for the wrist have an additional value in the treatment of the hemiplegic hand.

Method. Twenty patients with a hemiplegic hand after stroke where divided into two groups. The intervention group received therapy based upon the KNGF guideline "stroke". In addition they received manual mobilization of the carpal bone structures. The control group received only the usual therapy. Both groups received the therapy twice a week for a period of 6 weeks. Two subjects were lost to follow up. Therefore the analysis is based upon the data of eighteen subjects. The follow up was after 6 and 10 weeks. The primary outcomes were passive full ROM, passive dorsal flexion and the Frenchay arm test for functional recovery. Analysis was performed using the Friedmann's test, the Wilcoxon test and the Mann-Whitney U-test. Furthermore correlations were calculated with the Spearman's rho correlation coefficient.

Results. Statistical significant differences were found in the MT group between T0 and the T2 measurement in 4 of the 5 outcome measures. This was not found in the control group. Also there were differences between the two groups in all outcome measures. Furthermore we found a correlation between the improvement in passive dorsal flexion and the improvement in the FAT. (See figures 1+2 and the table)

Discussion and conclusion. This study shows a strong indication that manual mobilization of the wrist has a supportive influence on the recovery of the hemiplegic hand. However, repetition of this study in a large scale RCT is recommended. Replication of the results is then needed.

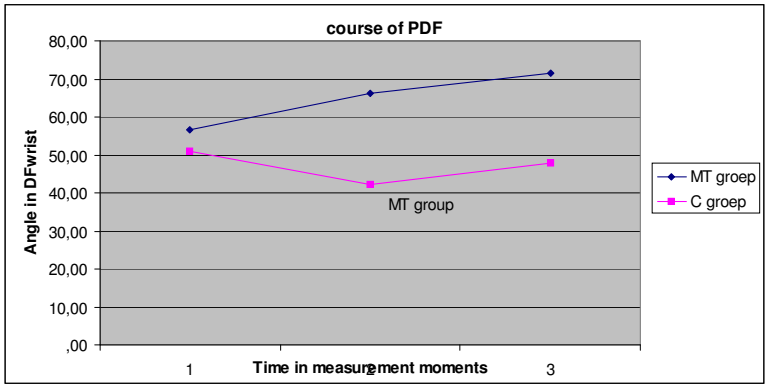


Figure 1:
Course of the mean values of the Dorsal flexion of the affected side.

In Blue the MT group

In Red the Control group

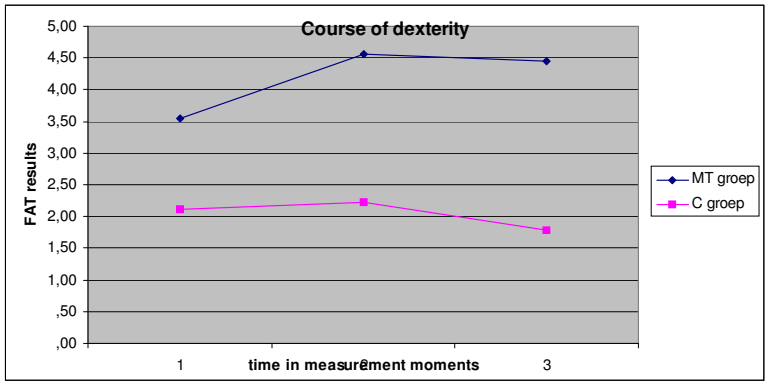


Figure 2:
Course of the mean values of the Frenchay Arm Test

In Blue the MT group

In Red the Control group

Measurement	Group	T0	T1	T2	P-value difference between T2 and T0 within the group (Wilcoxon)	P-value difference between MT and C-group (Mann-Whitney U-test)
VAS / NRS	MT-group	2,09 (0,547)	1,78 (0,434)	1,33 (0,236)	P=0,10	
	C-group	1,22 (0,147)	1,67 (0,373)	2,00 (0,408)	P=0,10	
						P=0,033*
PDF in degrees	MT-group	57,73 (3,259)	66,11 (2,860)	71,67 (3,632)	P=0,007*	
	C-group	51,11 (5,122)	42,22 (6,407)	47,78 (4,339)	P=0,34	
						P=0,003*
PROM in degrees	MT-group	131,91 (5,214)	143,33 (5,000)	150,56 (6,149)	P=0,007*	
	C-group	128,89 (7,718)	121,11 (7,349)	127,22 (4,573)	P=0,48	
						P=0,01*
MAS	MT-group	1,55 (0,282)	0,78 (0,364)	0,56 (0,338)	P=0,024*	
	C-group	2,22 (0,278)	2,33 (0,236)	1,89 (0,389)	P=0,180	
						P=0,077
Squeeze force in kgF	MT-group	12,55 (2,069)	14,00 (2,261)	15,44 (2,550)	P=0,026*	
	C-group	7,67 (2,028)	7,11 (2,627)	6,67 (2,550)	P=0,108	
						P=0,004*
Frenschay Arm Test	MT-group	3,27 (0,359)	4,56 (0,294)	4,44 (0,242)	P=0,038*	
	C-group	2,11 (0,455)	2,22 (0,494)	1,78 (0,572)	P=0,180	
						P=0,01*

*Table: summary of the results from the important measurements to quantify motoric and functional recovery. The mean +/- the SEM are used to describe the data. The Wilcoxon test is used to test on statistical significant differences within the group. The Mann-Whitney U-test is used to test on differences between the groups in respect to changes within the groups. PDF = passive dorsal flexion of the wrist, PROM = passive Range of Motion of the wrist from palmar to dorsal flexion, MAS= Modified Ashword Scale, *= p< 0,05*

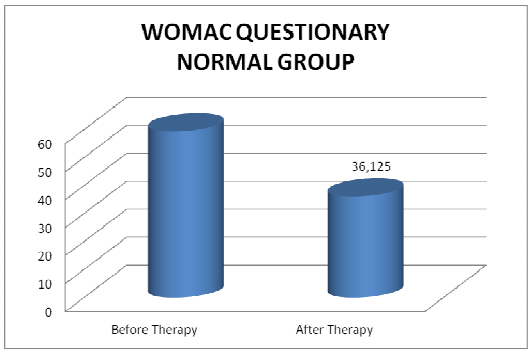
TOTAL HIP REPLACEMENT, first results from Atilla

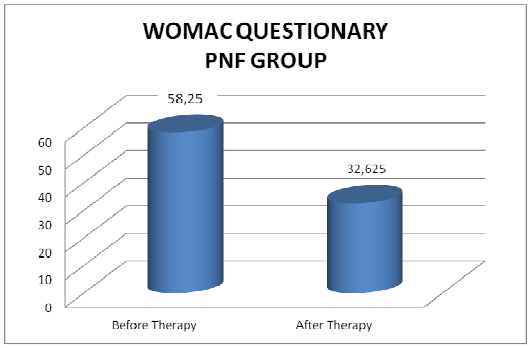
Introduction. After total hip replacement patients have often a changed mobility and a decrease in different activities and restrictions in participation. In this study we measure how the PT treatment with the PNF concept can change that effectively. From the status after the operation till the patient can have a normal physiological load on the leg. Also we were checking how the patients' daily life situation changed.

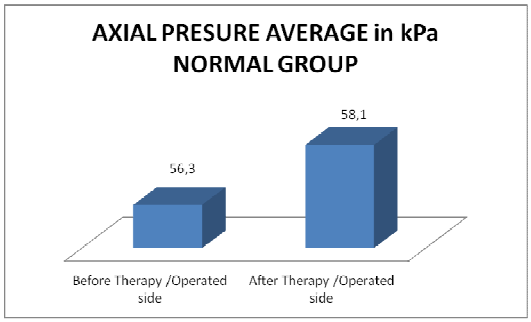
Method and materials. A total amount of 16 people after total hip prosthesis operation were divided into two groups, control and intervention. The patients were between the 6th and 19th postoperative week. The control group (8 patients) received the usual therapy. The other group was treated with the PNF concept. Both groups received 10 treatments. The measurements were before the first treatment and after the 10th treatment. The idea was to show how the center of body mass moved over the base of support and to ask the patient about changes in the daily life activities. The two groups were compared. The measurement was done with a sensory platform and with the foot checker 4 programs. For the measurement of ADL improvement we used Harris Hip score and Womac questioner.

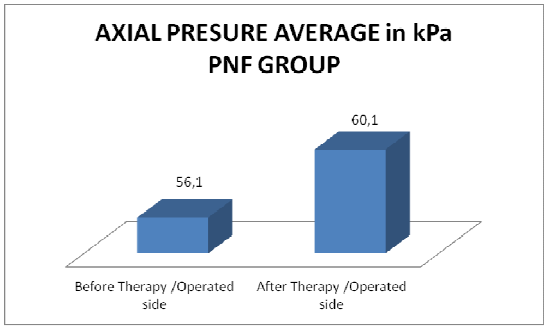
Results: Differences were found between the two groups. Significant differences were found in the Womac questioner. Differences were found also in the axial pressure over the standing foot.(see tables)

Conclusion: The study showed that the application of the PNF Concept within the PT treatment is very useful in the early rehabilitation after total hip replacement.









Agniezka finished one article (her doctor thesis – it was published in Polish) and the chapter, which will be published in English in the book "Scoliosis" (she hopes). The title of this chapter is "The impact of spinal deformity on gait pattern in subjects with scoliosis". The chapter was accepted it will (probably) be printed in 2-3 months. I hope it will be useful for IPNFA because I mentioned about our group and PNF concept.

We looked and found ---- >some nice abstracts

Clinical Rehabilitation 2007; **21**: 395–410

Physiotherapy treatment approaches for the recovery of postural control and lower limb function following stroke: a systematic review

Alex Pollock Stroke Therapy Evaluation Programme, Academic Section of Geriatric Medicine, Glasgow Royal Infirmary, Glasgow, **Gillian Baer** Department of Physiotherapy, Queen Margaret University College, Edinburgh, **Peter Langhorne** Academic Section of Geriatric Medicine, Glasgow Royal Infirmary, Glasgow and **Valerie Pomeroy** Rehabilitation and Ageing, Geriatric Medicine, St George's University of London, London, UK Received 30th September 2006; accepted 6th October 2006.

Objectives: To determine whether there is a difference in global dependency and functional independence in patients with stroke associated with different approaches to physiotherapy treatment.

Data sources: We searched the Cochrane Stroke Group Trials Register (last searched May 2005), Cochrane Central Register of Controlled Trials (CENTRAL) (Cochrane Library Issue 2, 2005), MEDLINE (1966 to May 2005), EMBASE (1980 to May 2005) and CINAHL (1982 to May 2005). We contacted experts and researchers with an interest in stroke rehabilitation.

Review methods: Inclusion criteria were: (a) randomized or quasi-randomized controlled trials; (b) adults with a clinical diagnosis of stroke; (c) physiotherapy treatment approaches aimed at promoting postural control and lower limb function; (d) measures of disability, motor impairment or participation. Two independent reviewers categorized identified trials according to the inclusion/exclusion criteria, documented the methodological quality and extracted the data.

Results: Twenty trials (1087 patients) were included in the review. Comparisons included: neurophysiological approach versus other approach; motor learning approach versus other approach; mixed approach versus other approach for the outcomes of global dependency and functional independence. A mixed approach was significantly more effective than no treatment control at improving functional independence (standardized mean difference (SMD) 0.94, 95% confidence interval (CI) 0.08 to 1.80). There were no significant differences found for any other comparisons.

Conclusions: Physiotherapy intervention, using a 'mix' of components from different 'approaches' is more effective than no treatment control in attaining functional independence following stroke. There is insufficient evidence to conclude that any one physiotherapy 'approach' is more effective in promoting recovery of disability than any other approach.

Unilateral strength training increases voluntary activation of the opposite untrained limb

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ABSTRACT

Objective: We investigated whether an increase in neural drive from the motor cortex contributes to the cross-limb transfer of strength that can occur after unilateral strength training.

Methods: Twitch interpolation was performed with transcranial magnetic stimulation to assess changes in strength and cortical voluntary activation in the untrained left wrist, before and after 4 weeks of unilateral strength-training involving maximal voluntary isometric wrist extension contractions (MVCs) for the right wrist ($n = 10$, control group = 10).

Results: Wrist extension MVC force increased in both the trained (31.5 ± 18%, mean ± SD, $p < 0.001$) and untrained wrist (8.2 ± 9.7%, $p = 0.02$), whereas wrist abduction MVC did not change significantly. The amplitude of the superimposed twitches evoked during extension MVCs decreased by 35% (±20%, $p < 0.01$), which contributed to a significant increase in voluntary activation (2.9 ± 3.5%, $p < 0.01$). Electromyographic responses to cortical and peripheral stimulation were unchanged by training. There were no significant changes for the control group which did not train.

Conclusion: Unilateral strength training increased the capacity of the motor cortex to drive the homologous untrained muscles.

Significance: The data show for the first time that an increase in cortical drive contributes to the contralateral strength training effect.

“Ino 2”

Training Mechanism and Therapeutic Applications for the improvement of the Functional Standing Ability

Konstantinos D. Papantonopoulos, PT, IPNFA Can. Instructor, NDT Therapist

Concise Presentation

1. Main Idea and Hypothesis

The training mechanism “Ino 2” provides support at the knees for persons with sensory or motoric loss, as a result of deficit at the Central Nervous System, and upholds the standing and striding position for therapeutic applications.

The motive for the development of the device was the request of the patient to acquire more experience in standing and striding position. This need was expressed with the phrases: “Look, when I am standing everything works better. I can feel that

my legs are working and the connection between my feet, my thighs and my trunk" and "Please do find me a way to practice standing. I need to load weight on my feet".

The hypothesis was that if a way could be found to support the Lower Extremities (LE) as less as possible, while maintaining the proper alignment and allowing small motions to occur, the guided loading of the weight of the trunk over the feet, during the effort for standing, would increase the proprioceptive activity and, in return, the kinetic response of the LE.

This improvement may provide the pelvis with functional stability and the trunk muscles with a fixed point ("punctum fixum") that would enhance their activity to maintain the trunk at the upright position. The enhancement of the trunk may allow the Upper Extremities (UE) to move at the space instead of working to accept a part of the weight of the trunk.

The purpose of the application is to provide wheelchair users with potential ability an opportunity to use their LE and to longer the upright positioning for short distance walkers.

2. Pathological Biomechanics and Goals: The use of the Upper Extremities to accept a part of the weight of the patient

A. Description of the Pathological Biomechanics

a. When a patient uses a pair of crutches or a walker to maintain standing he / she employs the UE to accept a part of the weight of the body. This decreases the amount of the weight that is loaded at the LE and, in turn, the proprioceptive stimuli provided by the feet, the hips and the spine. The same may appear during physical therapy training in the parallel bars.

b. In the long run the patient relays on the LE less and less and uses the UE more and more in a vicious circle. This creates a new kinetic model where instead of supporting the UE to move in the space now the trunk is supported over the UE.

c. As the trunk is hanging continuously from the "roof" of the shoulder girdle, the muscles are at a prolonged elongation stage, the Golgi organs are activated and reduce the activity of the muscles, whereas in standing the different parts of the trunk "press" from above the lower parts and create "approximation" and activation of the muscle spindles that in turn activate the muscles and promote trunk stability and posture.

d. This process sets the deposition of the weight of the trunk over the LE and the relief of the UE as a basic therapeutic goal.

B. Reasoning, Implementation, Results

a. The wealth of the proprioceptive stimuli provided by the feet during dynamic loading in close chain is enhanced when the UE are not used to support standing.

b. The therapeutic implementation of "Ino 2" supports the LE as less as possible in accepting the weight of the body and directs it to the feet. While the feet accept the weight of the trunk, the proprioceptive activity is enhanced and, in return, the kinetic response of the LE is enhanced.

c. The increased activity of the LE through loading creates the solid foundation that is necessary to support the pelvis. As the pelvis becomes more stable provides the abdomen muscles with a fixed point that enhances the recruitment of motor units at the upright position that provide dynamic support and develop functional activity (combined stabilizing, concentric and eccentric contraction) and. This process prevents the usage of the UE for weight acceptance activities and allows free movement in space.

d. As dynamic stability is achieved the therapist's hands are released and can apply more dynamic stimuli (as approximation to the trunk) or removed for the

development of more independent applications (hands Off) that will enhance the autonomous usage of the pelvis and the trunk from the patient.

e. The support at the knees is provided during the transition from sitting to standing, at standing and at striding position. During the transition from sitting to standing the device stabilizes the knees and the femur slides over the tibia. Close to upright position the device does not support the knees but guides them and directs the loading from the weight over the feet.

f. The provided support does not cage the limbs and allows small motions to occur that develops the proprioception. The tactile stimuli are limited at the feet and the knees.

g. During the independent usage of the device the patient can acquire experience over time in standing and become more able to correct him / her self (intrinsic feedback) in order to improve the Postural Control at the upright position.

h. After a period of usage some patient show increment of the rhythm of walking, the length of the stepping, the speed of walking and the walking time until the first stop.

3. Description

Frontal view, same height of knee support, 15 mm foam layer thickness

The apparatus provides support at the knees in a frame of parallel bars.

The supporting mechanisms for the knees can move independently and are adjustable at height, position and direction, to support the lower extremities in standing and striding position.

An additional option is to support only one lower extremity, allowing the other to move independently in repeated stepping.

Both the supporting mechanism and the parallel bars are placed over a wooden platform that functions as the floor.

Frontal view, different height of knee support,
30 mm foam layer thickness

At the surface of the platform a choice of materials can be placed to differentiate the degree of challenge, from completely solid (wood) to foam layer of different thickness.

Different materials offer varying degrees of stability at the points that the foot press, increasing the challenge and proprioception and causing the LE to work.

View from the top, striding position

View from the side, striding position

4. Treatment Applications

Emphasis is given on the relation between the leg and the foot to strengthen the response of the weight – bearing leg:

- The ankles are in ≈ 5 ° flexion and the plantar flexors are in relative elongation and contraction preparedness.
- The mass centre of gravity passes in front of the tibia over the navicular bone.
- Hands On stimulation can be implemented at the foot to stimulate the longitudinal arch.
- Specific insoles can be used to aid the anatomical position of the foot and correct the deviations in order to distribute the loads all over the foot. The loading of the weight on this position promotes proprioception and enhances the architecture of the foot to accept the weight of the entire body.

During treatment additional materials can be used to increase the level of challenge in standing or in striding position:

1. With stable floor surface (wood) different stimuli can be added at the UE, such as elastic bands, balls, boxing bag, etc.
2. Decreasing the stability of the floor with the usage of foam substrate.

- The main therapeutic aim is to achieve the Optimal Level of Challenge where sensory stimuli are reinforced to the extent that can produce sufficient kinetic response.
- Key criteria remain the dynamic activation of the LE, the alignment of the joints during loading, the enhancement of muscle coordination and the continued successiveness of muscle activity from the feet to the support of the trunk.

- The therapeutic process may include training in different phases of gait cycle with applications that ranging from direct therapeutic facilitation (Hands – On) to minimal guidance of the muscle activity ("Hands Less"), and to independent activities (Hands Off).

5. Discussion

During the first ten months of trials and adjustments the training apparatus "Ino 2" has been used in different pathologies with common need the use of the trunk while loading weight over the lower extremities and using the upper extremities free in the space. These pathologies were: Cerebral Palsy with and without Baclofen Pump, Multiple Sclerosis, Paraplegia from Spinal Cord Injury and Hemiplegia after Stroke or Traumatic Brain Injury.

The enhanced muscular activity of the LE allows the activation of the trunk at the function of the upright position: the tilting of the pelvis can be corrected, the foot can be activated as the knee moves into extension and promotes mass activity, the abdomen muscles are activated at the length and the position needed to support the trunk and the upper limbs can move freely in space.

One of the advantages of "Ino 2" is that allows the therapeutic applications from prolonged striding position for patients with loss of sensory and motoric ability. In this position the connection of the pelvis and the LE becomes more dynamic; the muscles can produce greater response after the loading of the weight and the function of the trunk is increased.

The main difference from using braces for standing is that "Ino 2" allows small motion to occur in all the joints of the LE. This enhances the proprioception and the motoric response; whereas, most of the times, the feet inside the brace have limited opportunities for motion.

In conclusion, the exploitation of the untapped potential of the lower extremities with dynamic loading, especially for people with relevant sensory ability, the prolongation of the time for experience and self-correction from this position and the avoidance of the secondary consequences from not using the lower limbs in subjects with initial weakness of support ("Learned Non Use") was the impetus for the development of "Ino 2".

The first results were encouraging as the muscle response was enhanced both in the applications of facilitation (approximation, patterns of UE, targeted activity) and the strengthening of the sensory input through loading.

Two different versions are used, one for the therapeutic training with a skilled physical therapist and one for the independent usage from an experienced patient at his / her home.

The question of secure applications, the possibility of independent use of the device by the client and his / her relatives, the flexibility and the adoptability at the specific needs of the person, were issues with particular emphasis at the whole project.

6. Application Examples

6,1. Cerebral Palsy (Diplegia) Using Baclofen Pump.
Mrs. G. P., 20 y.o.

- The main change that the patient noted after the usage of the Baclofen Pump was the development of sensation and proprioception.
- Using the "Ino 2" the patient achieved the accumulation of experience in dynamic upright position resulting in enhanced kinetic response of the LE and their functional connection with the trunk
- Specifically, the feet created a better response as the arch was enhanced through the development of active plantar flexion. In this way the feet provided the necessary stable background for the overall activation of the LE.
- With acquiring experience over time the LE became capable of providing support to the trunk. The coordination of muscle groups in close chain that starts from the dynamic response of the plantar flexors to loading and continues throughout the length of the LE, supports the trunk and releases the UE.

6,2. Stroke (Hemiplegia)
Mrs. E. G., 76 y.o.

- The support provided by the "Ino 2" at the LE enabled the therapist to enhance the therapeutic applications and to focus on the overall activity of the patient.
- The applications of facilitation (Hands On) focused on the correction of the pelvis, approximation at the corrected position, facilitation of the transition of the weight and repeated stepping with weight bearing at the hemiplegic limb.
- With acquiring experience it made possible the independent activities under the supervision of the therapist, such as self – correcting, orientation in the space from standing and the voluntary changing of the centre of gravity.

6,3. Multiple Sclerosis

- The main aim of the therapeutic applications was the usage of the LE to accept the weight of the trunk in order to improve standing and avoid the consequential problems as development of spasticity, muscle atrophy, stiffness, osteoporosis, etc.).
- The results were:
  1. Reduction of muscle atrophy and spasticity of the LE.
  2. Strengthening of the abdomen muscles in the upright position.
  3. Improvement of the reflexes and balance reactions.
  4. Enhancement of the function of the trunk to fix the UE to move in space.

7. Conclusion

The training mechanism for the functional upright position “Ino 2” can be both a useful tool in the hands of the therapist, as it allows more complete and more targeted therapeutic applications, and a tool for lasting self-gaining experience from this position as it provides the opportunity for Hands On and Hands Off applications.

The applications can be complemented with elastic bands that will be used with the UE to activate the entire body at the upright position.

Extensive clinical experience and research can further develop the apparatus and the therapeutic applications, such as the use of sensitive surfaces in the weight (as scales) that will provide the patient with information and feedback for the loading of the feet.

The first public presentation of the mechanism and the therapeutic applications of "Ino 2" took place during the annual meeting of the International Proprioceptive Neuromuscular Facilitation Association (www.ipnfa.org) at the Kaiser Foundation Rehabilitation Centre, Vallejo, California, USA, at October 20 – 22, 2011.

The patenting process begun on November 2011 with a relative application at the Agency of Industrial Property in Greece and is currently under investigation ("Patent Pending")

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Concept and Development: Konstantinos D. Papantonopoulos

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