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# Newsletter IPNFA research committee

*The second newsletter of 2013 is now in front of you. We are proud to present our sixth edition at the end of our first decade as a standing committee. In the meeting of 2003 the research committee was installed as an official standing committee within the IPNFA. That means we are now celebrating our 10<sup>th</sup> anniversary. We would like to look back on these 10 years. In this place I would like to thank all the members who have been and/or still are part of the research committee. On behalf of the research committee, I wish a joyful reading. Fred.*

## **The early beginning:**

Back in 2000 The IPNFA annual general meeting was in Mainz, Germany. At that meeting research was debated and it was proposed to install a research committee. The idea was supported by Tim Josten and it was suggested that Fred Smedes could start that job with aid from Russel Lee and from Tim in the background. The first committee members were: Tim Josten, Kirsten Gotz, Beate Selker, Cynthia Wederick, Dee Liliy Masudo, Russel Lee, and Fred Smedes. In the first two years the work was rather small, the contact between us three was poor, and reporting at the general meeting was not required since we were no official committee, but we did in 2002, Cracow. In that year it was pointed out that the objectives of the IPNFA as stated in article 4 section e, f and h from the IPNFA constitution are:

- e) To promote research into PNF theory and practice.
- f) To identify further developments in the PNF concept.
- h) To develop peer review in order to maintain the necessary clinical and educational standards required to teach PNF.

So at the meeting from 2002 it was suggested that the research committee would write as proposal to adjust the constitution with a new article. The committee did so for the general meeting of 2003 where the research committee was installed as a standing committee. The concerning article is now art 28 of the constitution. The research committee is the only standing committee that may have participants who are no full member (yet). The idea is that other members, like associate members can also contribute to the further development of the PNF-concept.

The first official members of the committee besides Fred were: Kirsten Götz Neumann, Beate Selker, Russel Lee and Tim Josten, after that we lost Russel and until 2006 we were just 4.

In 2006 Beate retreated and we received 3 new members: Agnieszka Stepień, Alexander Lizak and Susanne Reinprecht. A year later Renata Horst and Marcos Aziz replaced Tim and Kerstin. After that we received contribution from Seong soo Hwang and Mathias Schulte, and later from Sakis Adamidis and Attila Szabo. At this moment the committee is represented by Agnieszka Stepień, Sakis, Attila, Marianne Heidmann, Nicola Fisher and Fred.

## **Results from the first decade:**

- A guide line on evidence based practice in physiotherapy (2003)
- Literature list and Dutch Stroke guideline in English with over 500 references in cooperation with the KNGF (Royal Dutch Physiotherapy Association) (2004)
- Power point on how to interpret scientific publications (still on the IPNFA website under reports Res. Com. 2005)
- Total literature list with **all articles in Full text** as pdf files on CD-ROM for all participating members on the meeting of 2006 (Ljubjana)

- Case studies published in Dutch and in English on the IPNFA website (even found translated in Portuguese on a Brazilian Blog)
- Clarification of the term: “irradiation” by the original text of sir Charles Scott Sherrington from 1906 (2007)
- Judgement guidelines for deciding on a price for articles from IPNFA members (only issued once) (2007)
- Master study results from a Hungarian student (under downloads on the website)
- Participation in a Delphi study on the: “*validation of the ICF Core Sets for spinal cord injury from the perspective of health professionals*”. From Professor Stucki and the Munich Medical University (2009)
- Presentation on international podia from Fred on the IFOMT conference 2008, Renata and Agnieszka on the WCPT conference 2011 all presentation are available on the website under downloads.
- The newsletter started in 2011, an idea from Seong soo Hwang and Matthias Schulte carried out by Fred, all available under downloads.
- Help at several requests for further information on PNF or on setting up smaller research projects.
- Regular update of the literature list, divided in sections under resources on the website
- Workshops on research issues on instructor day 2008 and 2012.
- Grant guidelines to help setting up further bigger research projects with the focus on PNF
- Collaboration with a bigger research project on the effect of PNF on gait in stroke patients.

### PHOTO contest Seoul 2013

Like we proposed in the newsletter of March 2013 we are already looking forward to our next meeting in Seoul. Our host Seong-soo Hwang showed us fantastic pictures of his country, city and culture.

Now we would like to use the breaks at the meeting in Seoul for a (digital) picture gallery of our PNF culture. So it would be great to show each other how our PNF work is performed?

One could think of PNF in clinical patient work or sessions of teaching PNF in courses.

It is encouraging to see course participants active with each other or active with patients. It is interesting for general participants to see teaching sequences from different courses in the breaks.

Just take your picture(s) on a USB stick to the meeting, and Fred will make a picture gallery show on the laptop. In a kind of contest, all people who attend the meeting could vote on the most impressive picture, the best looking PNF performance etc.

At the end of the meeting we would have a winner.



1) A class room in Turkey.



2) Flex / Abd/ Ext. Rot with some 350 participants

## Evidence Based Practice:

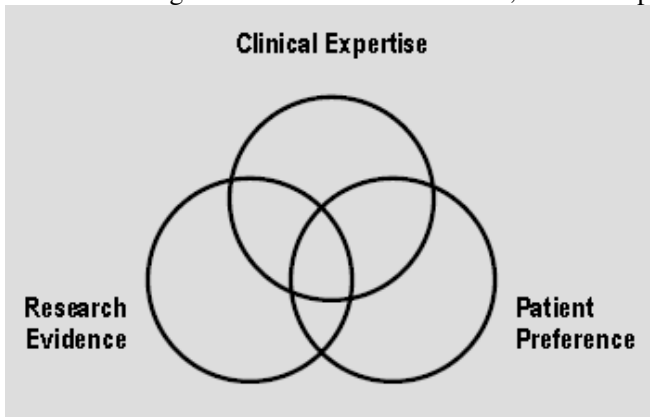
A couple of months ago I received a question; whether it is possible to have evidence for a concept. Like is there proof for the PNF concept as such. There exactly starts the confusion and the mistake about Evidence Based Practice (EBP). We can not proof PNF in general, neither is that the objective of EBP.

EBP is the practice of medicine and therapy in a specific situation. So EBP comes forward at the moment we ask our self's: Is there evidence / proof to use a PNF based therapy in the situation of .....a specific indication.

For example is there evidence that PNF based therapy has a better outcome in improving stride length and gait speed then general balance training in patients after an amputation? This kind of question is called a **PICO** based search question. **P** is patient category (amputation patients) **I** is intervention (PNF based therapy) **C** is comparison (general balance training) and **O** is outcome (improving stride length and gait speed).

With this kind of question we can start searching existing literature. Two nice publications can be found that favour PNF based therapy over the comparison therapy in their study. One is from Yigiter K et.al. 2002 and one is from Sahay P et. al. 2013 (see abstract in the section we looked and found)

Now Sacket's definition states: "*conscientious, explicit and judicious use of current best evidence in making decisions about individual patients*" (Sackett et al, 1996). This is reflected in Figure 1, which depicts clinical decisions taking account of research evidence, clinical expertise and patient preference (Haynes et al, 1996).



**Figure 1: A Model for Evidence-Based Clinical Decisions** This means that besides the published scientific outcomes, we also have to take in account our own personal expertise and the patient values. So this means that even when in scientific studies a specific approach is proven to be more effective, but the patient is not convinced of that specific intervention, one might consider a different strategy with a different approach and intervention since your expertise as a therapist tells you that a unmotivated patient will not achieve the (based upon the research) expected outcomes.

So to the initial question: Do we have evidence for the PNF concept? We have to say NO.

To the more specified questions: Is there evidence that PNF based therapy has effective outcomes in specific patient categories and / or specific treatment objectives? We have to say YES. For example in Amputated patients, in stroke patients on gait improvement and on trunk control improvement, in Female Chronic Low Back Pain patients, furthermore in improving ROM, in achieving a cross education effect. Some of the above mentioned issues we have the full text publication available and they are listed in the literature list under resources on the IPNFA website. We updated the literature list with some newly found publication. Also from those we have the full text available as pdf file. This new list will be on the website after the meeting in Seoul (October 2013).

Encouraging in this perspective is the Review from Westwater-Wood, Adams and Kerry.

They published a Narrative Review that has similarities with the overview of excising literature that the research committee provided in 2006 (Ljubljana, Slovenia) Now here the abstract

Narrative Review

Sarah Westwater-Wood<sup>1</sup>, Nicola Adams<sup>2</sup>, Roger Kerry<sup>1</sup>

## **The use of proprioceptive neuromuscular facilitation in physiotherapy practice,** *Physical Therapy Reviews*, 2010; VOL. 15; NO. 1; 23-28

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**Aims:** The aim of this paper is to critically review the evidence base for the use of proprioceptive neuromuscular facilitation (PNF) in physiotherapy practice. Given the evolving understanding of underlying physiological concepts and research developments in the more than 50 years since Herman Kabat originated the concept, there is a need to review the current evidence base.

**Method:** Empirical studies investigating the effectiveness of PNF for increasing range of movement and functional rehabilitation for clinical and non-clinical populations along with patterns and irradiation concepts were reviewed.

**Results:** Although it was difficult to draw definitive conclusions due to the lack of cognate studies and varying methodological quality of papers, a number of studies did demonstrate encouraging results for the use of PNF, particularly with regard to increasing range of movement.

**Conclusions:** Further research is needed to explore individual components of PNF therapeutic approaches and their wider application in key clinical populations such as stroke with standardized outcome measures appropriate to clinical practice. Secondly there is need for the development of new paradigms to fully consider the underlying physiological concepts explaining the effectiveness of PNF. **Keywords:** Proprioceptive neuromuscular facilitation, Evidence, Review

Additionally to this abstract I like to quote some interesting and promising parts of the text.

### **Functional rehabilitation**

*There is evolving interest in PNF as a technique to improve functional ability. In a small scale experimental interventional study of n=11 subjects recruited from an assisted-living population, Klien et al.<sup>29</sup> examined the impact of PNF on physical function. A beneficial effect of PNF training was found for flexibility (ROM shoulder flexion  $P=0.016$ , ankle dorsiflexion  $P=0.09$ ) and isometric strength (hip extension  $P=0.031$ , ankle flexion  $P=0.000$  and extension  $P=0.031$ ). Measures of physical function (sit-to-stand  $P=0.042$ ) also improved.*

*Kraft et al.<sup>32</sup> carried out an RCT of n=18 chronic stroke subjects randomly allocated to either a treatment group (EMG stimulation, bias/balance treatment and PNF) or a no treatment control group. The Fugl-Meyer post-stroke motor recovery test, grip strength and the Jebsen-Taylor hand function test were used to assess the effects of treatment on the paretic upper limb. Improvements were seen with the PNF group compared to the control.*

*Whilst there are more studies focusing upon a hemiplegic population, only one study was identified using PNF for chronic musculoskeletal pain. (The study from Kofotolis, 2006)*

### **Implication of PNF patterns**

*The study results of Shimura and Kasai 2002 demonstrated a reduction in EMG latency ( $P<0.01$ ) with larger MEP amplitude ( $P<0.05$ ) in the PNF position compared to the neutral one. Although a small sample, the results are in keeping with widely accepted neural mechanisms involving the influence of feedback (sensory) position changes on feed forward (motor) threshold activity.*

*All applied exercises in the study of Arai et al. 2001 had an effect; however, the PNF patterns were found to have a significant cross-education.*

***The above small scale studies provide preliminary findings to support the effectiveness of PNF***

We looked and received ---- > some nice abstract with the help from several IPNFA colleagues involved in their master studies all to be shared with us. The full text articles are available, just e-mail to Fred

Sahay P, et al., **Efficacy of proprioceptive neuromuscular facilitation techniques versus traditional prosthetic training for improving ambulatory function in transtibial amputees**, Hong Kong Physiotherapy Journal (2013), <http://dx.doi.org/10.1016/j.hkpj.2013.02.002>

**Abstract:** The objective of this randomized controlled trial was to evaluate the efficacy of proprioceptive neuromuscular facilitation (PNF) techniques in comparison to traditional prosthetic training (TPT) in improving ambulatory function in trans tibial amputees. Thirty study participants (19men and 11women )with unilateral trans tibial amputation participated in the study. They were randomly allocated to either the traditional training group (i.e., TPT) (nZ15) or the PNF training group (nZ15). The treatment in the TPT group consisted of weight-bearing, weight-shifting, balance, and gait exercises for 30minutes daily for 10 treatment sessions. In the PNF group, the same activities were performed by employing PNF principles and techniques. The outcome measures were gait parameters (e.g., stride width, step length, and stride length) and the locomotor capability index (LCI). The between-group comparisons at the end of the trial showed that the PNF group showed significant improvement in gait parameters and in the LCI, compared to the TPT group ( $p<0.05$ ). The results of the study suggested that prosthetic training based on proprioceptive feedback is more effective than the traditional prosthetic programme in improving ambulatory function.

Dildip Khanal, R. M. Singaravelan, and Subhash M. Khatri. **Effectiveness of Pelvic Proprioceptive Neuromuscular Facilitation Technique on Facilitation of Trunk Movement in Hemiparetic Stroke Patients** *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, Volume 3, Issue 6 (Jan.- Feb. 2013), PP 29-37

**Abstract:**

**Background:** As the pelvic motion comes from trunk muscles, a specific use of pelvic pattern not only exercises the pelvis for mobility and stability but also facilitate trunk motion and stability.

**Objective:** To determine the effect of Pelvic Proprioceptive Neuromuscular Facilitation(PNF) technique on facilitation of trunk movement in hemiparetic stroke patients.

**Interventions:** Thirty hemiparetic stroke patients were randomly divided into two groups. The experimental group received pelvic PNF while the control group received conventional physiotherapy in the form of truncal exercises for 30 minutes. Along with these both group received regular physiotherapy in the form of tonal management and range of motion exercises for the affected limbs for 30 minutes. Intervention was given once in a day for five days/week for four weeks.

**Outcome Measures:** Trunk Impairment Scale (TIS), Trunk Lateral Flexion Range of Motion (TLF ROM), and Tinetti Test (TT).

**Results:** Post-intervention, both the groups shows improvement on trunk performance, range of motion, balance and gait but the experimental group shows more improvement than control group [changes in mean score between group comparison for TIS 3.4 (1.8); TLF ROM for affected and non-affected side 0.734 & 3.666 (0.267 & 2.533); Balance 3.534 (2.266) and Gait 2.2 (1)]. The level of significance was set at  $p < 0.05$  and highly significance at  $p < 0.01$ .

**Key words:** Inclinator, Pelvic Proprioceptive Neuromuscular Facilitation, Stroke, Tinetti Test, Trunk Impairment Scale, Trunk Lateral Flexion Range of Motion

Nicola Fisher, Master thesis abstract, 2013 (see poster on page 7, enlarge to 150 or 200 %)

### **Title: „Hands On vs. Hands Off“**

Comparison of two physiotherapy treatment approaches in motor outcome after stroke: "Proprioceptive Neuromuscular Facilitation" (PNF) vs. "Task-Specific Training" (Motor Relearning Programme) - a randomized controlled trial **OBJECTIVE:** To evaluate the efficacy of a well-established in Germany, physiotherapy hands-on therapy (PNF) in comparison with an evidence-based hands-off therapy (task-specific training = AST) in terms of the ability to walk after a stroke. **Design:** Controlled, randomized trial with blinded evaluation

**Setting:** Department of Neurological Rehabilitation

**Participants:** Patients with first-onset stroke in the post-acute, inpatient rehabilitation (n = 15)

**Interventions:** All patients received the standard treatment of the interdisciplinary rehabilitation facility. During the intervention period of 3 weeks, the PNF group (n= 8) received a daily, one hour lasting, individual physical Training based on the PNF Concept (Hands On), the AST group (n=7) with Tasks Specific Training (Hands Off). Both groups received an add-on therapy, consisting of 30 minutes sessions of gait training either PNF or AST, three times a week for a total of three weeks. **Outcome measures:** The primary outcome variable was the walking speed (10-meter-walk Test). Secondary outcome variables were functional mobility (Timed Up and Go Test), the strength of the lower extremity (Chair Raise Test) and the general motor skills after stroke (Motricity Index). **Results:** In both groups, significant improvements in all outcome variables were measured. The mean improvements were, except for Motricity Index, the PNF group higher compared to the AST group, but did not achieve significance level. The walking speed (10-Meter-Walk Test) improved in the PNF group somewhat more (Mean  $\pm$  SD: 13,5s  $\pm$  11,67s) as in the AST group (10,29s  $\pm$  11,92s) but not significantly (p = 0.53). Analysis of the results of the Timed Up and Go Test showed not statistically different effects (p = 0.29) in the PNF group (21,67s  $\pm$  16,93s) compared to the AST group (9,93s  $\pm$  5,43s). Results were similar in Chair Raise Test ((PNF) 13,67s  $\pm$  13,6s and (AST) = 7s  $\pm$  5,26s) (p = 0.29). There were no significant differences in the Motricity Index between the PNF group (29,67P  $\pm$  16,69P) and the AST group (34,29P  $\pm$  18,81P) (p = 0.66). **Conclusions:** The present data from this ongoing trial, suggest that the Hands-On treatment of stroke patients with the PNF Concept is non-inferior in comparison to (evidence-based) Hands-Off Task Specific Training (alias Motor Relearning Programme). Further studies with greater number of participants are needed.

Carroll, Timothy J., Robert D. Herbert, Joanne Munn, Michael Lee and Simon C. Gandevia. **Contralateral effects of unilateral strength training: evidence and possible mechanisms.** *J Appl Physiol* 101: 1514–1522, 2006; doi:10.1152/japophysiol.00531.2006.—If exercises are performed to increase muscle strength on one side of the body, voluntary strength can increase on the contralateral side. This effect, termed the contralateral strength training effect, is usually measured in homologous muscles. Although known for over a century, most studies have not been designed well enough to show a definitive transfer of strength that could not be explained by factors such as familiarity with the testing. However, an updated meta-analysis of 16 properly controlled studies (range 15–48 training sessions) shows that the size of the contralateral strength training effect is  $\sim$ 8% of initial strength or about half the increase in strength of the trained side.

This estimate is similar to results of a large, randomized controlled study of training for the elbow flexors (contralateral effect of 7% initial strength or one-quarter of the effect on the trained side). This is likely to reflect increased motoneuron output rather than muscular adaptations, although most methods are insufficiently sensitive to detect small muscle contributions. Two classes of central mechanism are identified. One involves a “spillover” to the control system for the contralateral limb, and the other involves adaptations in the control system for the trained limb that can be accessed by the untrained limb. Cortical, subcortical and spinal levels are all likely to be involved in the “transfer,” and none can be excluded with current data. Although the size of the effect is small and may not be clinically significant, study of the phenomenon provides insight into neural mechanisms associated with exercise and training.



## Comparison of two physiotherapy treatment approaches in motor outcome after stroke: "Proprioceptive Neuromuscular Facilitation" (PNF) vs. "Task-Specific Training" (Motor Relearning Programme) - a randomized controlled trial

N. Fischer, W. Obhof, T. Widmann

Abb.1: Hands On Gait Training with PNF



### Background:

•Task specific training shows a high level of evidence in the Outcome of motor functioning of the lower extremities and walking in stroke patients (Level 1a, Foley et al., 2012)

•In Germany, PNF is a traditional frequently used treatment approach with neurological patients, which has been recognized by the leading health insurance associations. The level of evidence is limited to a few clinical studies and expert opinions (Buck et al., 2005; Wang, 1994).

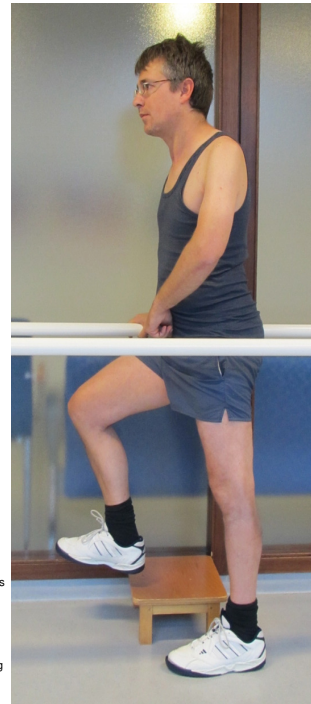
### Goal:

- To prove the effectiveness for the pnf concept
- To compare the efficacy of both approaches in terms of walking ability in stroke patients

### Method:

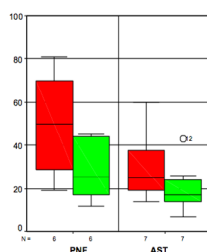
- We conduct a controlled, randomized study with blinded evaluation in the setting of the Department of Neurology of the ACURA Clinic Waldbrunn, Germany.
- Patients (rehabilitation phase C, n = 15) were randomized 1:1 after the first onset of a stroke in post-acute inpatient rehabilitation
- Both groups received the standard treatment of the interdisciplinary clinic.
- During the intervention period of three weeks, the PNF group (n = 8) was strictly PNF treated (Hands On), the AST group (n = 7) with task-specific training (Hands Off). Each of them in the usually scheduled frequency and time of the rehabilitation centre (approx. 45 minutes each day, five times per week)
- Both groups were given a total of 9 standardized gait trainings of 30 Minutes with PNF or AST as an add-on therapy over the three weeks.
- Primary outcome variable was the walking speed (10-Meter-Walk Test).
- Secondary outcome variables were functional mobility (Timed Up and Go test), strength of the lower extremity (Chair Raise Test), the speed of walking stairs (Staircase Test) and the general motor skills after stroke (Motricity Index).

Abb.2: Task orientated Hands Off Gait Training

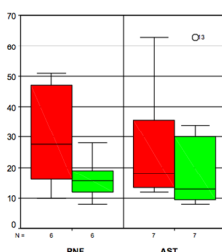


III. 1a,b: Pre- and Post-Test Values after 3 week Intervention with PNF / AST.  
Significant improvements could be measured in both groups (p<0,05)

III. 1a: Timed Up and Go Test (Pre- und PostTest / seconds)

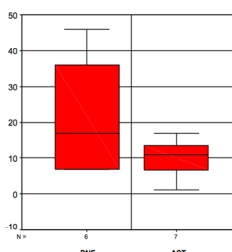


III. 1b: 10 Meter Walk Test (Pre- und PostTest / seconds)

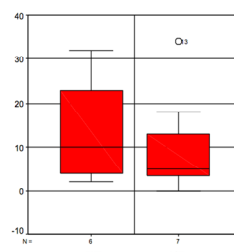


III. 2 a,b: Comparison of Outcome values (PNF vs. AST)  
No significant differences could be measured (p> 0,05)

III. 2a: Outcome of Timed Up and Go Test / seconds (PNF vs. AST)



III. 2b: Outcome of 10 Meter Walk Test / seconds (PNF vs. AST)



### Results:

•Significant improvements could be measured in both groups with all outcome variables.

•The improvement median values were similar in the PNF group in comparison to the AST group, with a tendency towards PNF (10-Meter-Walk: PNF: 10, AST: 5, p = n.s., TUG: PNF: 17, AST: 11, p = n.s., Chair Raise Test: PNF: 6.5, AST: 6.00, p = n.s., Motricity Index: PNF: 24.5, AST: 34.00, p = n.s.).

### Conclusions:

•Preliminary data from the study suggest that the effect of PNF Hands-on treatment in stroke patients is non inferior to (evidence-based) Hands-Off treatment with task-specific training (otherwise known as "motor relearning program").

•Further studies with greater numbers of participants and a longer period of investigation are necessary to prove a possibly existing benefit of hands-on treatment with the PNF concept.