

Content: reflection on trial results + Information on PNF symposia and conferences ----->1 **We received:** publication for visual and / or auditory stimulation.----->2+3 Publication indirectly related to the explanation for techniques----->4 **We Looked and found:** Two publications addressing PNF procedures irradiation, chop + Lift ----->5 Information from the research committee and from the WCPT----->6

February 2015

Newsletter IPNFA research committee

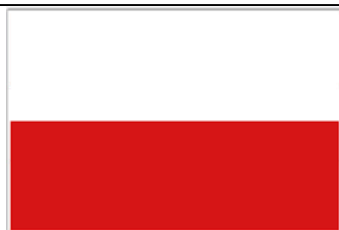
*In November 2014 the research committee received over 20 articles from several different colleagues (Benedikt, Marcel, Angela). We decided to read through them all to determine whether we can use them for further support in teaching the PNF-concept. Based on this reading we also found other publications related to the subjects addressed in the received articles. The first results that triggered our interest are presented in this Newsletter. We also received information about PNF oriented symposia and conferences on national level which want like to inform you about. But we like to start with a reflective view on evidence. This is from the highly respected and regarded LANCET. EBP is more then just applying results from RCT studies, we have to check to whom the results apply before we make a clinical decision.
I wish a joyful reading. Fred.*

Peter M Rothwell. External validity of randomised controlled trials: “To whom do the results of this trial apply?” *Lancet* 2005; 365: 82–93

In making treatment decisions, doctors and patients must take into account relevant randomised controlled trials (RCTs) and systematic reviews. Relevance depends on external validity (or generalisability)—ie, whether the results can be reasonably applied to a definable group of patients in a particular clinical setting in routine practice. There is concern among clinicians that external validity is often poor, particularly for some pharmaceutical industry trials, a perception that has led to underuse of treatments that are effective. Yet researchers, funding agencies, ethics committees, the pharmaceutical industry, medical journals, and governmental regulators alike all neglect external validity, leaving clinicians to make judgments. However, reporting of the determinants of external validity in trial publications and systematic reviews is usually inadequate. This review discusses those determinants, presents a checklist for clinicians, and makes recommendations for greater consideration of external validity in the design and reporting of RCTs

Information about the German **PNF Symposium:**

- Date: 14.November.2015
- Location: Herz-Jesu Krankenhaus, Bochum
- 9:00 am – 5:00 pm
- Organizer: AG PNF Germany, Werner Wimmeroth
- For further information contact info@ag-pnf.de
- Presentations and workshops will be held



1.

Information about Polish **PNF conference:**

- Date: 21.March.2015
- Location: Warsaw
- 9:00 am – 5:00 pm
- Organizer: IPNFA-Poland: <http://ipnfa.pl/>
- Already over 200 participants.
- Presentations and workshops in **PNF in Neurology**
- Parkinson, MS, Stroke , SCI, CP in adults etc.

In relation to the PNF Basic principles & procedures we received interesting articles on the effect of visual and verbal stimulus, single and in summation of each other. This in connection to enhanced motor learning and motor control.

Prodoehl J, Vaillancourt D. E, **Effects of visual gain on force control at the elbow and ankle** *Exp Brain Res.* 2010 January; 200(1): 67–79. doi:10.1007/s00221-009-1966-3.

Abstract

Visual feedback is essential when minimizing force fluctuations. Varying degrees of somatotopic organization have been shown in different regions of the brain for the upper and lower extremities, and visual feedback may be processed differently based on the body effector where feedback-based corrections are used. This study compared the effect of changes in visual gain on the control of steady state force at the elbow and ankle. Ten subjects produced steady-state isometric force to targets at 5 and 40% of their maximum voluntary contraction at seven visual gain levels. Visual gain was used effectively at both joints to reduce variability of the force signal and to improve accuracy, with a greater effect of visual gain at the elbow than the ankle. Visual gain significantly decreased the regularity of force output, and this effect was more pronounced at the elbow than the ankle. There were accompanying changes in the proportion of power in the 0–4, 4–8, and 8–12 Hz frequency bins of the force signal across visual gain at the elbow. Changes in visual gain were accompanied by changes in both agonist and antagonist electromyographic (EMG) activation at the elbow. At the ankle joint, there were only changes in agonist EMG. The results suggest better use of visual information in the control of elbow force than ankle force and this improved control may be related to the changes in the pattern of agonist and antagonist activation.

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**VISUAL AND VERBAL SUMMATION ENHANCE MUSCLE OUTPUT IN YOUNG
FEMALE SUBJECTS**, Lutheran University of Brazil, ULBRA 2011

Background: muscle strength, understood as the muscle capacity to generate tension in an active way, is a concept that occupies an important place in kinesiological knowledge, both for evaluation and treatment. Exteroceptive neurofunctional stimuli are described as a set of techniques used in order to facilitate movement.

Objectives: To evaluate the production of muscle strength of the rotator cuff muscles generated by different modalities of exteroceptive stimuli, to determine whether the combination of isolated exteroceptive stimuli provides an increase in muscle strength.

Methods: A quasi-experimental study performed from March to April 2012 at the Clinical School of Physiotherapy ULBRA / TORRES. The sample consisted of 80 individuals, divided into four groups of 20 subjects each: Blindfolded group (Blf), Verbal Stimulation Group (SVerb), Visual Stimulation group (SVis) and Summation Group (SUM). All subjects were submitted to the same protocol for the evaluation of muscle strength by dynamometry.

Results: 80 subjects were included and randomly divided into four groups of 20 individuals each. Of all the evaluated measurements, dynamometry showed a significant difference when comparing SOM x EVE ($p < 0.041$), SOM x EVI ($p < 0.048$), and found the greatest statistical difference when comparing the SOM group with the OLV group ($p < 0.03$).

Conclusion: according to these results, we conclude that the force production varies according to the proposed mode of stimulation, and the summation of stimuli presented significant difference when compared with their absence.

For auditory stimulation we checked the following articles for implementation of auditory stimuli in patients with Parkinson's disease. This fits within the philosophy of functional approach.

Freedland RL, Festa C, Sealy M, McBean A, Elghazaly P, Capan A, Brozycki L, Nelson AJ, Rothman J : The effects of pulsed auditory stimulation on various gait measurements in persons with Parkinson's Disease. *NeuroRehabilitation* 17 (2002), 81–87.

Abstract: The purpose of this study was to examine the Functional Ambulation Performance Score (FAP; a quantitative gait measure) in persons with Parkinson's Disease (PD) using the auditory stimulation of a metronome (ASM). Participants ($n = 16$; 5F/11M; range 60–84 yrs.) had a primary diagnosis of PD and were all independent ambulators. Footfall data were collected while participants walked multiple times on an electronic walkway under the following conditions: 1) RETEST: establishing baseline cadence, 2) ASM: metronome set to baseline cadence, 3) 10ASM: metronome set to 10% above baseline cadence, 4) POSTTEST. FAP scores increased between PRETEST and POSTTEST. PRE/POSTTEST comparisons also indicated decreases in cycle time and double support and increases in step length and step-extremity ratio (step length/leg length). The results confirm prior findings that auditory stimulation can be used to positively influence the gait of persons with PD and suggest beneficial effects of ASM as an adjunct to dopaminergic therapy to treat gait dysfunctions in PD.

Suteerawattananon M, Morris GS, Etnyre BR, Jankovic J, Protas EJ: Effects of visual and auditory cues on gait in individuals with Parkinson's disease *Journal of the Neurological Sciences* 219 (2004), 63– 69.

Abstract

The purpose of this study was to determine if combining visual and auditory cues has a greater effect on the gait pattern of patients with Parkinson's disease (PD) than the cues applied individually. Twenty-four individuals with idiopathic PD were recruited. Patients, while off anti-parkinsonian medications, were measured on a 7.62-m walkway during two trials for each of four conditions performed in random order: without cues, with a visual cue, with an auditory cue and with both cues simultaneously. The auditory cue consisted of a metronome beat 25% faster than the subject's fastest gait speed. Brightly colored parallel lines placed along the walkway at intervals equal to 40% of a subject's height served as the visual cue. Average gait speed, cadence and stride length were calculated for each condition. Gait velocity, cadence and stride length significantly improved ($p < 005$) when cues were used. Visual and auditory cues improved gait performance in patients with PD, but they did so in different ways. Auditory cueing significantly improved cadence, but visual cueing improved stride length. The simultaneous use of auditory and visual cues did not improve gait significantly more than each cue alone.

Conclusion: Visual and auditory cues improved gait performance in patients with Parkinson's disease. The simultaneous use of auditory and visual cues did not improve gait significantly more than each cue alone. For teaching and treating within the PNF philosophy using Basic Principles & Procedures these publication might be helpful in explaining and understanding the application of the PNF-concept. In relation to the publication from Mahoney JR et al.(2011) tactile stimulation connected to auditory stimulus might be considered (see newsletter February 2014) Multisensory integration across the senses in young and old adults. *Brain research* 2011, 43-53

In relation to techniques like **Rhythmic Initiation** and **Replication** aiming for a motor learning effect for scapular position the following article might be of interest. Information about contributing muscle activity is provided

Sarah L. Mottram a,* , Roger C. Woledge b, Dylan Morrissey

Motion analysis study of a scapular orientation exercise and subjects' ability to learn the exercise. *Manual Therapy* 14 (2009) 13-18

Exercises to retrain the orientation of the scapula are often used by physiotherapists to optimise shoulder girdle function. The movements and muscle activity required to assume this position have not yet been quantified. Further, patients often find this a difficult exercise to learn accurately, with no data being available on the accuracy of repeated performance. The primary objective of this study was to quantify the movements occurring during a commonly used scapular orientation exercise. The secondary objective was to describe the ability of subjects to learn this position after a brief period of instruction. A group of normal subjects (13 subjects; mean age 32, SD 4.9) were taught the scapular orientation exercise. Measurement of the position and muscle actions were made with a motion analysis system and surface electromyography. Further comparison was made of the accuracy of repeated trials. The most consistent movements were upward (mean 44°, SEM 4.9°) and posterior rotation (mean 44°, SEM 4.6°). All parts of the trapezius muscle demonstrated significant activity in maintaining the position while latissimus dorsi did not. Repeated trials showed that subjects were able to accurately repeat the movement without guidance. The key movements of, and immediate efficacy of a teaching approach for, scapular orientation have been established.

In relation to stretch the study from Shimamoto et al, 2009 might explain with what kind of response a patient might react to stretch stimulus. This article provides insight in the fundamentals of sarcomere anatomy and physiology.

Yuta Shimamoto, Inter-sarcomere coordination in muscle revealed through individual sarcomere response to quick stretch, PNAS, July 21, 2009, 11954–11959 doi: 10.1073/pnas.0813288106

The force generation and motion of muscle are produced by the collective work of thousands of sarcomeres, the basic structural units of striated muscle. Based on their series connection to form a myofibril, it is expected that sarcomeres are mechanically and/or structurally coupled to each other. However, the behavior of individual sarcomeres and the coupling dynamics between sarcomeres remain elusive, because muscle mechanics has so far been investigated mainly by analyzing the averaged behavior of thousands of sarcomeres in muscle fibers. In this study, we directly measured the length-responses of individual sarcomeres to quick stretch at partial activation, using micromanipulation of skeletal myofibrils under a phasecontrast microscope. The experiments were performed at ADP-activation (1 mM MgATP and 2 mM MgADP in the absence of Ca²⁺) and also at Ca²⁺-activation (1 mM MgATP at pCa 6.3) conditions. We show that under these activation conditions, sarcomeres exhibit 2 distinct types of responses, either “resisting” or “yielding,” which are clearly distinguished by the lengthening distance of single sarcomeres in response to stretch. These 2 types of sarcomeres tended to coexist within the myofibril, and the sarcomere “yielding” occurred in clusters composed of several adjacent sarcomeres. The labeling of Z-line with anti- α -actinin antibody significantly suppressed the clustered sarcomere “yielding.” These results strongly suggest that the contractile system of muscle possesses the mechanism of structure-based inter-sarcomere coordination.

Interesting to see is how PNF is also advocated in orthopaedic and sports rehabilitation, although a closer analysis of the description provided, let us conclude that the authors have their own interpretation of the procedures chopping and lifting.

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The Chop and Lift Reconsidered: Integrating Neuromuscular Principles into Orthopedic and Sports Rehabilitation. NORTH AMERICAN JOURNAL OF SPORTS PHYSICAL THERAPY | AUGUST 2008 | VOLUME 3, NUMBER 3

The upper extremity bilateral PNF patterns, better known as the “chop and lift” are well known to physical therapists. These patterns which utilize spiral and diagonal motions of the upper extremity can be used for both assessment and treatment of sports and orthopedic injuries. Half kneeling and tall kneeling postures fall between low-level postures such as rolling and 4-point, and high-level postures of standing and walking. Half kneeling and tall kneeling can be considered transitional postures. When the chop and lift patterns are used in conjunction with the half and tall kneeling developmental postures, the techniques are an excellent assessment of core stability/instability. Combinations of the upper extremity patterns and the developmental postures can be powerful corrective training techniques. The combined experience of the three authors is used to describe techniques for equipment setup, testing, assessment, and treatment of athletic imbalances. These techniques require and promote instantaneous local muscular activity as developmental postures and balance reactions are incorporated. The therapeutic use of both PNF and developmental patterns has been a hallmark of rehabilitation of patients with neurologic dysfunction, but can be equally and effectively applied in the sports and orthopaedic rehabilitation setting.

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The Effects of Abdominal Hollowing in Lower-limb PNF Pattern Training on the Activation of Contralateral Muscles. *J. Phys. Ther. Sci.*25: 1335–1338, 2013

Abstract.

[Purpose] The purpose of this study was to determine the effects of abdominal hollowing during lowerlimb proprioceptive neuromuscular facilitation (PNF) training on the activation of contralateral muscles.

[Subjects] Twenty male college students without symptoms or signs of muscular or nervous disease participated in this experiment after signing a consent form.

[Methods] All the subjects were measured with electromyography (EMG) in a muscle activation test before and after abdominal hollowing. In the PNF program, the lower-limb pattern of PNF training, was maintained for 5 seconds, followed by a 2-minute break. This was repeated three times. The resting

time between sets was 30 minutes. Surface EMG (Keypoint, Medtronic Inc., USA) was used for the measurements, and the highest value of three measurements was used in the analysis.

[Result] The results revealed a significant change in the muscular activation of the opposite-side lower limbs. The muscular activations of the vastus lateralis, tibialis anterior, semitendinosus and gastrocnemius were increased significantly after the abdominal hollowing.

[Conclusion] The findings suggest that abdominal hollowing in PNF pattern training can be effective at promoting muscular activation of the contralateral muscles. To promote muscular activation of the opposite side in lower-limb PNF pattern training, abdominal hollowing should be considered to improve the effect of PNF pattern training.

From the Research Committee; your attention required for *motor learning* within our PNF courses.

At the instructor day at the meeting in Greece it was agreed to start using the proposed 12 principles for motor learning in our courses in relation to the specific use of basic procedures and principles and the PNF techniques for motor learning effects.

This year has to be regarded as a pilot to find out how satisfying it is to use these motor learning ideas more explicit.

We would like to know about your experiences with these principles. **Therefore we will ask for feedback in the period of June 2015.**

With this feedback we want to reflect on the presented ideas and transfer them into a proposal for the instructor day; to take them into the common script.

One has to consider questions like:

- Are the 12 principles of motor learning helpful to make the participants understand this part of philosophy better?
- Which of the 12 principles did you use most, and why?
- In what kind of indication / patient examples do you use the principles?
- Are there specific techniques that benefit from more specific use of motor learning, which techniques are that?
- Are there specific Basic Principles & Procedures that benefit from more specific uses of motor learning, which BPP are that?

We will send in June a specified questionnaire to all instructors.

To remind you of the presented principles, we refer to the **News Letter from August 2014** (see IPNFA website!!! Under news) <http://www.ipnfa.org/index.php/news/newsletter>

From the WCPT (World Confederation for Physical Therapy) the following information:

Exercise programmes free to all

Last week's [WCPT News](#) included an article announcing WCPT's new professional partnership with [Physiotherapyexercises.com](#) – a web-based service run by physical therapists that enables colleagues around the world to generate exercise programmes for their patients. The website, available in multiple languages, provides access to over 1,000 exercises for people with different injuries and disabilities.



Find out how you can benefit and read the full article at: bit.ly/1DgAtok.

Access free case studies



One of WCPT's continuing education partners, Educata, has announced a new website featuring patient case studies: www.ptcasesudies.com. The first case looks at the treatment of a patient presenting with central cervical pain.

The whole case study is available to view at no charge, with a paid-for option to earn continuing education credits and access the full suggested bibliography.