August 2015

Newsletter IPNFA research committee

The general meeting in Vallejo is due. This meeting will be interesting for several reasons. First of all we celebrate 25 years of IPNFA!!!. We will have a busy instructor day and an interesting educational day with the main topic being Neural Plasticity: Encouraging the Brain to Change Through Rehabilitation. Isn't that close to motor learning effects? This is one of our 5 points from the PNF Philosophy. Last year we already filled one newsletter with this fine issue. Now we will make the next step and provide a preview on motor control. This topic will be addressed at the instructor day. Naturally we also provide you again with interesting reading materials in connection with motor control. We received a two issues series concerning proprioception in musculoskeletal therapy. In this way we can see how a big part of the professional field regards the issue of proprioception. ….and we received two publication from IPNFA members for the annual contest of best publication from within the IPNFA. We hope this will stimulate others to follow…
I wish a joyful reading. Fred.

Masterclass

Proprioception in musculoskeletal rehabilitation. Part 1: Basic science and principles of assessment and clinical interventions

Ulrik Röijezon [a, *], Nicholas C. Clark [b], Julia Treleaven [c]

Manual therapy 2015;20:368-377

A B S T R A C T

Introduction: Impaired proprioception has been reported as a feature in a number of musculoskeletal disorders of various body parts, from the cervical spine to the ankle. Proprioception deficits can occur as a result of traumatic damage, e.g., to ligaments and muscles, but can also occur in association with painful disorders of a gradual-onset nature. Muscle fatigue can also adversely affect proprioception and this has implications for both symptomatic and asymptomatic individuals. Due to the importance of proprioception for sensorimotor control, specific methods for assessment and training of proprioception have been developed for both the spine and the extremities.
Purpose: The aim of this first part of a two part series on proprioception in musculoskeletal rehabilitation is to present a theory based overview of the role of proprioception in sensorimotor control, assessment, causes and findings of altered proprioception in musculoskeletal disorders and general principles of interventions targeting proprioception.
Implications: An understanding of the basic science of proprioception, consequences of disturbances and theories behind assessment and interventions is vital for the clinical management of musculoskeletal disorders. Part one of this series supplies a theoretical base for part two which is more practically and clinically orientated, covering specific examples of methods for clinical assessment and interventions to improve proprioception in the spine and the extremities.

Masterclass

Proprioception in musculoskeletal rehabilitation. Part 2: Clinical assessment and intervention

Nicholas C. Clark [a, *], Ulrik Röijezon [b], Julia Treleaven [c]

Manual Therapy 2015;20:378-387

A B S T R A C T

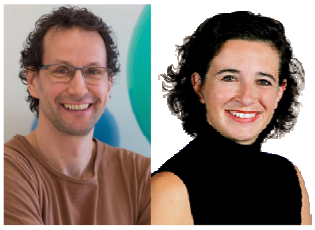
Introduction: Proprioception can be impaired in gradual-onset musculoskeletal pain disorders and following trauma. Understanding of the role of proprioception in sensorimotor dysfunction and methods for assessment and interventions is of vital importance in musculoskeletal rehabilitation. In Part 1 of this two-part Masterclass we presented a theory-based overview of the role of proprioception in sensorimotor control, causes and findings of altered proprioception in musculoskeletal conditions, and general principles of assessment and interventions.
Purpose: The aim of this second part is to present specific methods for clinical assessment and interventions to improve proprioception in the spine and extremities.
Implications: Clinical assessment of proprioception can be performed using goniometers, inclinometers, laser-pointers, and pressure sensors. Manual therapy, taping, and bracing can immediately enhance proprioception and should be used to prepare for exercise interventions. Various types of exercise (active joint repositioning, force sense, co-ordination, muscle performance, balance/unstable surface, plyometric, and vibration training) should be employed for long-term enhancement of proprioception.

Patterned control of human locomotion

Francesco Lacquaniti[1,2,3], Yuri P. Ivanenko[3] and Myrka Zago[3]

J Physiol 590.10 (2012) pp 2189–2199

Abstract There is much experimental evidence for the existence of biomechanical constraints which simplify the problem of control of multi-segment movements. In addition, it has been hypothesized that movements are controlled using a small set of basic temporal components or activation patterns, shared by several different muscles and reflecting global kinematic and kinetic goals. Here we review recent studies on human locomotion showing that muscle activity is accounted for by a combination of few basic patterns, each one timed at a different phase of the gait cycle. Similar patterns are involved in walking and running at different speeds, walking forwards or backwards, and walking under different loading conditions. The corresponding weights of distribution to different muscles may change as a function of the condition, allowing highly flexible control. Biomechanical correlates of each activation pattern have been described, leading to the hypothesis that the co-ordination of limb and body segments arises from the coupling of neural oscillators between each other and with limb mechanical oscillators. Muscle activations need only intervene during limited time epochs to force intrinsic oscillations of the system when energy is lost.



From the research committee members; Carsten and Nicola

Motor Control

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1. Definition and background of Motor Control
2. Postural control
3. Activities

1 Definition and Requirements

- Definition of Motor Control

Motor control *is defined as the ability to regulate or direct the mechanisms essential to movement* (Shumway-Cook & Woollacott 2011).

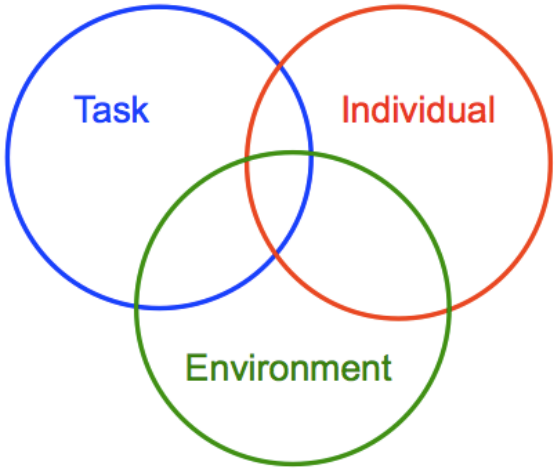


Figure1: Movement emerges from interactions between the individual, the task and the environment

adapted from Shumway-Cook (Shumway-Cook & Woollacott 2011)

- Theories of Motor Control
- Sensory Contributions to Motor Control

closed-loop control system, (Adams 1971; Schmidt & Lee 2011).

- Vision
- Audition
- Cutaneous Receptors
- Proprioception
- Muscle Receptors
  - Muscle Spindels
  - Golgi Tendon Organs
- Joint Receptors
- Vestibular System

(Shumway-Cook & Woollacott 2011; Schmidt & Lee 2011; Horst 2005; Adler u. a. 2013)

➢ Central Contributions to Motor Control

open-loop control system (Schmidt 1975; Schmidt & Lee 2011)

- Central Pattern Generators
- Reflex involvement in Locomotion
- Agonist-Antagonist Patterning
- Reciprocal Inhibition
- Generalized Motor Programs (in order to reduce the storage problem)
- Timing of Events

(Schmidt & Lee 2011; Shumway-Cook & Woollacott 2011)

2 Postural Control

- **Postural stability / stability limits**
- **Anticipatory postural control**
- **Postural orientation**

➢ Postural control emerges from the interaction of several systems
➢ Different variables can influence the amount of the challenge of a motor task (e.g. postural control)

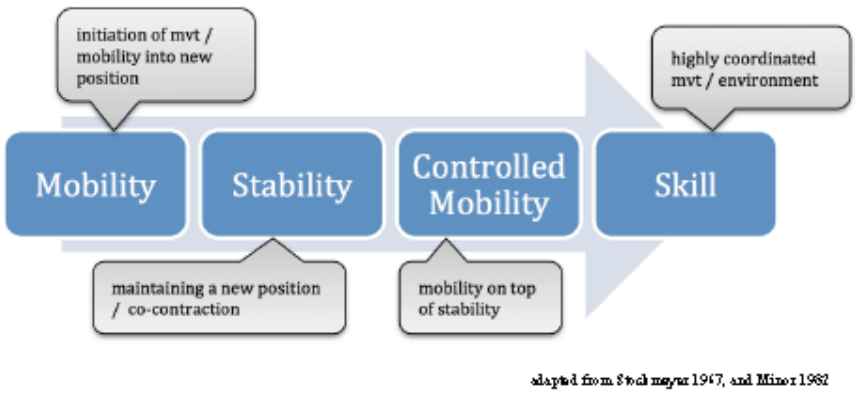
3 Activities

- **Maintaining a position and transfer**

The ability to change positions, wether moving from sitting to standing, rolling, rising from a bed, getting up from the floor and of course walking, is a key feature of our independence as human beings. PNF-Therapists therefore must be able to define the requirements:

- The essential characteristics of the action (Biomechanics, Kind of Muscle Work against gravity etc.)
- The sensory motor strategies that normal individuals typically use to accomplish the task (Movement Patterns and Timing)
- Adaptations required for changing environmental characteristics (Shumway-Cook and Woolacott, 2011) or motor impairment (e.g.: "Trick-Movements" in spinal cord injuries)

figure 2: „Stages of motor Control Model" for analysis and grading of motor control problems for defined activities (Stockmeyer 1967; Minor u. a. 1982)



adapted from Stockmeyer 1967, and Minor 1982

4 **Reaching, Grasping:** requirements and features

- eye-hand coordination
  - reaching a body part
  - reaching an external target

Facilitation means to ease the patient's motor control of an action. PNF means to do this by stimulating the extero- and and proprioceptors. According to the model of Shumway-Cook and Woollacott the physiotherapist is a part of the patient´s environment. Hence, PNF creates an artificial adapted stimulating environment in order to enable the patient to perform a task successfully.

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From our IPNFA member Tomasz Maicki we received two articles that were published in Poland. Both articles were submitted to the annual contest of best publication from within the IPNFA. The decision on the winning publication will be announced at the business day in Vallejo. From both articles all authors are members of the IPNFA.

Here are at least the two abstracts.

Nr 1: *Tomasz, Rafal and Ewa* all three are members of the IPNFA.
Agata was responsible for the translation and Wojciech is ther main physician of the rehab clinic.

Tomasz Maicki[1], Rafał Trąbka[1], Agata Pawełczyk[2], Wojciech Szwarczyk[1], Ewa Górna[3]

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[2] RST Rehabilitation
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PNF concept in aspect of treatment of patient with orthopedic disorders in the foot

Abstract

Background: The study presents practical examples of therapy according to PNF concept which can be applied in rehabilitation of ankle joint. Presented exercises are used for patients with ankle joint dysfunction due to pathology treated conservatively or operated.

Materials and methods: The study presents a therapy for a patient with dysfunction of ankle joint. Exercises performed in the close and opened kinematic chain were aimed to restore the normal function of the ankle. According to the PNF philosophy in the first stage of a therapy indirect treatment (of non affected structures) was chosen with a goal to use stronger body parts to improve weaker ones. This helps the patient to achieve positive attitude to the therapy and gain trust. The next step is to add direct treatment with partial and total weight bearing of the treated leg. During exercises of the ankle joint focus was not only on the affected area, but also on improving muscle activity of knee and hip.

Conclusion: PNF treatment of the ankle joint gave good final therapeutic effects by influencing positive involvement of the patient and reducing fear of weight bearing. Increasing foot stability reduced pain and restored normal cooperation between agonists and antagonists, which improved independence and functioning in daily living.

Nr2: *Tomasz and Rafal* are both members of the IPNFA

Wojciech is the main physician of the rehab clinic, Pawel is the orthopaedic surgeon and Agata is responsible for translation.

Analysis of therapy results according to PNF concept in patients after total knee replacement

Tomasz Maicki[1], Rafał Trąbka[1],Wojciech Szwarczyk[1], Paweł Zieliński[2], Agata Pawełczyk[3]

Summary

Key words: knee osteoarthritis, knee replacement, PNF, knee pain, functional physiotherapy

Introduction

The study was based on the treatment of patients after total knee replacement by the concept of PNF. Analysis of the results of therapy were made in terms of reducing pain, improving the performance of activities of daily living and restoration of normal knee function.

Materials and methods

The study was conducted in 100 patients treated in Rehabilitation Center in Krakow. Qualification criterion was none previous surgery of hip and knee joints. Patients were treated by the concept of PNF. Patients underwent 10-day treatment and were treated from Monday to Friday twice a day for 30 minutes on Saturdays once a day. To evaluate the effectiveness of the proposed therapeutic procedure Staffelstein Score was used. The study was carried out day before surgery and after early rehabilitation following surgery at orthopedic ward.

Results

Statistically significant improvement was observed in patients treated with the concept of PNF. Patients achieved significant improvement in performing activities of daily living, mobility, knee function and reduction of pain.

Conclusions

- Rehabilitation of patients according to PNF concept allows to restore function, improve mobility and muscle strength.
- Staffelstein scale results analysis shows statistically significant difference in patients after 2-week therapy.

The WCPT informs us about upcoming events and services
From the latest WCPT news letter we selected three items

World Physical Therapy Day

There is now just over one month left to plan your activities to celebrate World Physical Therapy Day 2015. This year the theme is "Fulfilling potential", emphasising physical therapists' role in supporting people with long-term health conditions or disabilities achieve their goals, fulfil their potential and participate fully in society.

Posters, flyers and postcards with this year's theme are available for download from the toolkit page: www.wcpt.org/wptday-toolkit. From here you can also access a resources booklet with a list of facts and resources about physical therapy, independence and participation, as well as an article by the WCPT President (found in the resources booklet).

The posters, flyer and postcard are also available in Spanish at: www.wcpt.org/wptday-posters-spanish.

Remember to send us a brief report and photographs of how you celebrated the day to info@wcpt.org.

PEDro celebrates birthday at congress

PEDro, the internationally acclaimed physical therapy evidence database, is exhibiting at the WCPT Congress as it celebrates its 15th birthday.

It is the largest physical therapy-specific evidence resource, containing more than 30,000 reports of guidelines, reviews and trials. In 2013 it became a professional partner of the World Confederation for Physical Therapy – in recognition of the fact that the two organisations share similar objectives and values.
PEDro Manager Anne Moseley of the George Institute for Global Health and the University of Sydney said:
"The Congress is a great way to share PEDro with physical therapists worldwide.

"We are proud to say that PEDro is used in over 200 countries and has answered 13-million clinical questions in the last 15 years. One of the best things about PEDro is that is it a free online resource that helps the global physical therapy community stay informed about the latest physical therapy evidence."

PEDro is used in physical therapy practice, education and research. It only indexes research reports which use the best methods for evaluating intervention, specifically evidence-based clinical practice guidelines, systematic reviews and randomised controlled trials. Its home page is published in 11 different languages.

Search results are ranked by method (guidelines are displayed first and trials last). Trials are ranked by quality. "This helps to direct users to evidence which is most likely to be valid and contain sufficient information to guide clinical practice," Anne Moseley said.

She paid tribute to the generosity of 40 WCPT member organisations, whose support helps keep PEDro up-to-date.

PEDro can be found at stand D16 in the exhibition hall. The organisation is:

launching a new YouTube video on how to ask a clinical question in PICO format
launching a Turkish version of the PEDro web-site
conducting guided tours of the database in different languages
helping delegates search for high-quality research evidence to answer clinical questions
recording endorsement videos
obtaining feedback from delegates.

http://www.pedro.org.au/

Educata

One of WCPT's continuing education partners, Educata, has launched a new two hour online course on fall prevention. It covers the many simple, evidence-based, user-friendly tools to empower PTs and all health care practitioners to proactively identify those at higher risk for falling. bit.ly/1h2x2w8

A free peer-reviewed research paper on the effects of a fall prevention exercise programme on muscle strength and balance of the elderly is also available for download at: www.educata.com/articles.aspx

For further information about Educata go to: www.wcpt.org/node/29540