

Susan S. Adler
Dominiek Beckers
Math Buck

PNF in Practice



An Illustrated Guide
Third Edition

 Springer

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With 215 Figures in 564 Separate Illustrations

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To Maggie Knott, teacher and friend.

Devoted to her patients,
dedicated to her students,
a pioneer in profession



Preface

Proprioceptive neuromuscular facilitation (PNF) is a philosophy and a concept of treatment. The PNF philosophy is timeless, and the concept is a continuous process of growth. This third edition of our book, with a complete review, better user-friendly layout and integration of the latest developments, aims to support this growth.

PNF has been one of the most recognized treatment concepts in physical therapy since the 1940s. Dr. Kabat and Margaret (Maggie) Knott started and continued to expand and develop the treatment techniques and procedures after their move to Vallejo, California in 1947. After Dorothy Voss joined the team in 1953, Maggie and Dorothy wrote the first PNF book, published in 1956.

At first mostly patients with multiple sclerosis and poliomyelitis were treated with this method. With experience it became clear that this treatment approach was effective for patients with a wide range of diagnoses. Today, patients with neurological, traumatic as well as orthopedic symptoms are treated with this concept.

The three- and six-month PNF courses in Vallejo began in the 1950s. Physical therapists from all over the world came to Vallejo to learn the theoretical and practical aspects of the PNF concept. In addition, Knott and Voss traveled in the United States and abroad to give introductory courses in the concept.

When Maggie Knott died in 1978 her work at Vallejo was carried on by Carolyn Oei Hvistendahl. She was succeeded by Hink Mangold as director of the PNF program. Tim Josten is the present program director. Sue Adler, Gregg Johnson, and Vicky Saliba have also continued Maggie's work as teachers of the PNF concept. Sue Adler designed the International PNF Association (IPNFA) Advanced and Instructor course programs.

The authors acknowledge their debt to these outstanding people, and also to all members of the International PNF Association (IPNFA), and hope that this book will encourage others to carry on the work.

Developments in the PNF concept are closely followed throughout the world. It is now possible to take recognized training courses in many countries given by qualified PNF instructors.

There are other excellent books dealing with the PNF method, but we felt there was a need for a comprehensive coverage of the practical tools in text and illustrations. This book should thus be seen as a practical guide and used in combination with existing textbooks.

This book covers the procedures, techniques, and patterns within PNF. Their application to patient treatment is discussed throughout, with special attention on mat activities, gait and self-care. The emphasis within this book is twofold: developing an understanding of the principles that underlie PNF, and showing through pictures rather than with words how to perform the patterns and activities. Skill in applying the principles and practices of PNF to patient treatment cannot be learned only from a book. We recommend that the learner combine reading with classroom practice and patient treatment under the supervision of a skilled PNF practitioner.

Movement is our way to interact with our environment. Such interactions are directed by the mechanism of motor learning. Integration of motor learning principles includes a progression from hands-on to hands-off treatments; it includes goal-orientated functional activities and independence. Based on the untapped existing potential of all patients, the therapist will always focus on mobilizing these reserves to reach the highest level of function. Especially in the first and cognitive stage of motor control, the therapist's manual facilitation will be a help-

ful tool in reaching this goal. This includes goals on the level of body structures as well as on the activity level and the participation level (ICF).

This fully revised third edition includes a description of how the principles of the International Classification of Functioning, Disability and Health (ICF), and aspects of motor learning and motor control (from “hands-on” to “hands-off” management), are applied in modern PNF evaluation and treatment. The section on “Activities of Daily Living” has been expanded with new photos and more in-depth text instructions. The new design and layout highlight the clearly structured way in which the philosophy, basic procedures and treatment patterns of PNF are presented. Thus, this textbook provides a systematic and easily accessible guide to learning and understanding PNF as a practical tool and using it to full effect in patient treatment.

A special note of thanks goes to the following: Jan Albers and The Rehabilitation Centre in Hoensbroek (The Netherlands), F. Somers for the photography, colleague José van Oppen for acting as a model and Ben Eisermann for the drawings.

But most of all we are grateful to all our colleagues, the PNF instructors and all our patients. Without them this work would not be possible.

June 2007

S.S. Adler,
D. Beckers,
M. Buck

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Introduction to Proprioceptive Neuromuscular Facilitation



Q Definition and PNF Philosophy

Proprioceptive: Having to do with any of the sensory receptors that give information concerning movement and position of the body

Neuromuscular: Involving the nerves and muscles

Facilitation: Making easier

Proprioceptive Neuromuscular Facilitation (PNF) is a concept of treatment. Its underlying philosophy is that all human beings, including those with disabilities, have untapped existing potential (Kabat 1950).

In keeping with this philosophy, there are certain principles that are basic to PNF:

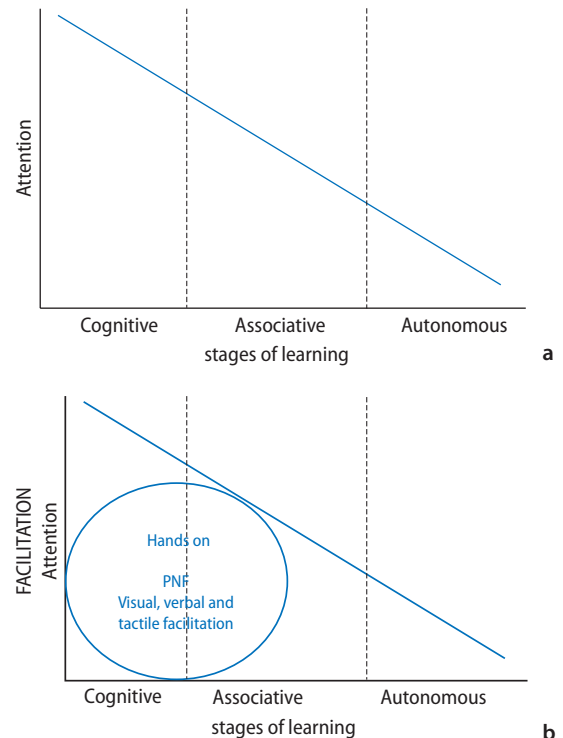
- PNF is an integrated approach: each treatment is directed at a **total human** being, not just at a specific problem or body segment.
- Based on the untapped existing potential of all patients, the therapist will always focus on mobilizing the patient's reserves.
- The treatment approach is always **positive**, reinforcing and using that which the patient can do, on a physical and psychological level.
- The primary goal of all treatment is to help patients achieve their **highest level of function**.
- To reach this highest level of function, the therapist integrates principles of motor control and motor learning. This includes treatment on the level of body structures, on the activity level as well as on the participation level (ICF, International Classification of Functioning, WHO).

PNF philosophy

1. Positive approach: no pain, achievable tasks, set up for success, direct and indirect treatment, strong start.
2. Highest functional level: functional approach, ICF, include treatment on body structure level and activity level.
3. Mobilize potential by intensive training: active participation, motor learning, self-training.

4. Consider the total human being: whole person with his/her environmental, personal, physical, and emotional factors.
5. Use of motor control and motor learning principles: repetition in a different context; respect stages of motor control, variability of practice.

Movement is our way to interact with our environment. All sensory and cognitive processes may be viewed as inputs that determine future motor outputs. There are some aspects of motor control and learning that are important for rehabilitation (Mulder 2004). One of the key elements of any interactive situation is the exchange of information. This is also true for any form of therapy. Without information, patients are severely limited in mastering new tasks. This is particularly important in



■ Fig. 1.1. a Different stages of motor learning (Fitts and Posner). b Facilitation and PNF in stages of motor learning (drawing by Ben Eisermann)

the first stages of motor learning (■ Fig. 1.1) and of the rehabilitation process when, due to the damage, the patient often can no longer trust his or her internal information. In these cases the therapist, and facilitation like PNF, becomes the most important source of external information.

This positive functional approach is, we feel, the best way to stimulate patients and to attain superior results from treatment.

This book covers the procedures, techniques, and patterns within PNF. Their application to patient treatment is discussed throughout with special attention to mat activities, gait, and self-care. The emphasis within this book is twofold: developing an understanding of the principles that underlie PNF, and showing through pictures rather than with words how to perform the patterns and activities. Skill in applying the principles and practices of PNF to patient treatment cannot be learned only from a book. We recommend that the learner combines reading with classroom practice and patient treatment under the supervision of a skilled PNF practitioner.

The aims of this book are:

- To show the PNF method and, in so doing, help students and practitioners of physical therapy in their PNF training.
- To attain a uniformity in practical treatment.
- To record the most recent developments in PNF and put them into word and picture.

Basic **neurophysiologic** principles:

The work of Sir Charles Sherrington was important in the development of the procedures and techniques of PNF. The following useful definitions were abstracted from his work (Sherrington 1947):

- **Afterdischarge:** The effect of a stimulus continues after the stimulus stops. If the strength and duration of the stimulus increase, the afterdischarge increases also. The feeling of increased power that comes after a maintained static contraction is a result of afterdischarge.
- **Temporal summation:** A succession of weak stimuli (subliminal) occurring within a certain (short) period of time combine (summate) to cause excitation.
- **Spatial summation:** Weak stimuli applied simultaneously to different areas of the body re-

inforce each other (summate) to cause excitation. Temporal and spatial summation can combine for greater activity.

- **Irradiation:** This is a spreading and increased strength of a response. It occurs when either the number of stimuli or the strength of the stimuli is increased. The response may be either excitation or inhibition.
- **Successive induction:** An increased excitation of the agonist muscles follows stimulation (contraction) of their antagonists. Techniques involving reversal of antagonists make use of this property (Induction: stimulation, increased excitability.).
- **Reciprocal innervation** (reciprocal inhibition): Contraction of muscles is accompanied by simultaneous inhibition of their antagonists. Reciprocal innervation is a necessary part of coordinated motion. Relaxation techniques make use of this property.

“The nervous system is continuous throughout its extent – there are no isolated parts.”

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Basic Procedures for Facilitation

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Therapeutic Goals

The basic facilitation procedures provide tools for the therapist to help the patient gain efficient motor function and increased motor control. Their effectiveness does not depend on having the conscious cooperation of the patient. These basic procedures are used to:

- Increase the patient’s ability to move or remain stable.
- Guide the motion by proper grips and appropriate resistance.
- Help the patient achieve coordinated motion through timing.
- Increase the patient’s stamina and avoid fatigue.

The basic facilitation procedures overlap in their effects. For example, **resistance** is necessary to make the **response to a stretch** effective (Gellhorn 1949). The effect of resistance changes with the alignment of the therapist’s body and the direction of the manual contact. The timing of these procedures is important to get an optimal response from the patient. For example, a preparatory verbal command comes before the stretch reflex. Changing of the manual contacts should be timed to cue the patient for a change in the direction of motion.

We can use these basic procedures to treat patients with **any diagnosis or condition**, although a patient’s condition may rule out the use of some of them. The therapist should avoid causing or increasing pain. Pain is an inhibitor of effective and coordinated muscular performance and it can be a sign of potential harm (Hislop 1960; Fisher 1967). Other contraindications are mainly common sense: for example, not using approximation on an extremity with an unhealed fracture. In the presence of unstable joints, the therapist should take great care when using traction or the stretch reflex.

The **basic procedures** for facilitation are:

- **Resistance:** To aid muscle contraction and motor control, to increase strength, aid motor learning.
- **Irradiation and reinforcement:** Use of the spread of the response to stimulation.

- **Manual contact:** To increase power and guide motion with grip and pressure.
- **Body position and body mechanics:** Guidance and control of motion or stability.
- **Verbal (commands):** Use of words and the appropriate vocal volume to direct the patient.
- **Vision:** Use of vision to guide motion and increase force.
- **Traction or approximation:** The elongation or compression of the limbs and trunk to facilitate motion and stability.
- **Stretch:** The use of muscle elongation and the stretch reflex to facilitate contraction and decrease muscle fatigue.
- **Timing:** Promote normal timing and increase muscle contraction through “timing for emphasis”.
- **Patterns:** Synergistic mass movements, components of functional normal motion.

Combine these basic procedures to get a maximal response from the patient.

2.1 Resistance

Therapeutic Goals

Resistance is used in treatment to:

- Facilitate the ability of the muscle to contract.
- Increase motor control and motor learning.
- Help the patient gain an awareness of motion and its direction.
- Increase strength.
- Help the patient relax (reciprocal inhibition).

Most of the PNF techniques evolved from knowing the effects of resistance.

Q Definition

The amount of resistance provided during an activity must be correct for the patient’s condition and the goal of the activity. This we call **optimal resistance**.