Susanne Klein-Vogelbach

Therapeutic Exercises in Functional Kinetics

Analysis and Instruction of Individually Adaptable Exercises

Foreword by W. M. Zinn

With 111 Figures
in 275 Separate Illustrations

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Foreword

In these analyses and instructions for economical movement therapy, Dr. Klein-Vogelbach, for many years head of the Physiotherapy School of the Kantonsspital in Basel, presents the second part of her published work on the school of functional kinetics which is her creation. This is a system of physiotherapy that has grown out of creative observation and consistent, independent development, one that, in its manner of observing and interpreting human movement, I have long regarded as a fundamental contribution to physio- and ergotherapy.

Although no explicit references are cited, this work accords with the findings of modern neurophysiology and biomechanics in every field. Here I will mention only the preventive and therapeutic value of economical posture and movement, the conception of the human being as an organism constantly reacting to gravity and other external stimuli, the therapeutic use that is made of postural reflexes, and a multitude of other facilitation techniques.

Repetition of an exercise or any other performance of the central nervous system results not only in a reduction of resistance at the synapses of the feedback control through which the stimulation potentials pass – this is the physiological basis of all learning, without which there could be no development – but also, in addition to the specific targeted increase in strength and performance, in an additional, generalized global facilitation. Perception training, self-experience and other types of body image training are highly important elements of any therapy aimed at alleviating pain and normalizing disturbances in the human support and movement apparatus. Thus, functional kinetics and the exercises developed from it constitute a method which is likely to pass with flying colours the test of comparative studies with control groups of differently treated or even untreated patients which will be necessary before it can achieve universal recognition.

This book contains a series of exercise instructions for physiotherapists, and I can only recommend most urgently that referring doctors should read them too. Once again, the author's decades of study and work with her material have resulted in a concise but extremely dense, closely packed text which will require concentrated reading. The thoroughness of presentation gives therapists imme-

diate access to meaningful, practical work and will allow them later to develop independently an unlimited and eminently individualizable exercise repertoire of their own. Special mention should be given here to the possibilities for physiotherapy in disorders of the spine and the shoulder and pelvic girdles, and the first logically constructed attempt to treat aerophagia: all methods whose value I can confirm after employing them for years in treating numerous patients in Bad Ragaz and Valens.

We rheumatologists too have been awaiting this book with impatience, and express our thanks to the author not merely for her important contribution to physio- and ergotherapy, but also for the great work she has taken on in addition in publishing her life's work in the service of our patients. A mastery of functional kinetics will allow therapists to understand the needs of sick and handicapped patients and to confine themselves to essentials. This will form a basis from which they can extend their knowledge of different specialties, such as proprioceptive neuromuscular facilitation, the treatment of rheumatic fever, psychosomatic disturbances or central and peripheral neurological symptoms, to name but a few. In this way, they will be helped to avoid the great temptation to one-sidedness by employing a variety of therapeutic methods, and to fulfil the requirements of the highest standards in their invaluable work.

Bad Ragaz, February 1978 W. M. Zinn

Preface to the English Edition

The best way to understand functional kinetics is by using it to treat patients. Practice was where it started; the theoretical underpinning followed later, when functional kinetics became a subject taught at training colleges. That, at any rate, is what happened in the German-speaking countries: in the English-speaking world it has yet to make its way.

The exercises presented here are models or norms: in practice, they need to be adapted to each individual patient, but without the goal of the exercise being lost. To overcome deficits in the patient's movement behaviour, it is not the patient who must adapt to the exercise, but the exercise which must be adapted to the patient. This is a challenge to the therapist that is demanding, but also stimulating. I hope that these therapeutic exercises will succeed in fascinating physiotherapists in the English-speaking world.

My thanks are due to all those mentioned in the prefaces to the German editions. For the English edition, special thanks go to: the translator, Linda Sloan-Ecker; Kersti Wagstaff, who edited the translation with me; and Elisabeth M. Bürge and Irene Gantert, who helped me in reading the English translation. At Springer-Verlag I have been cared for as sympathetically and patiently as always, and for this my warmest thanks go to Bernhard Lewerich, Marga Botsch (Medical Editorial I) and Heidrun Rieble (Book Production III).

Basel 1991 Susanne Klein-Vogelbach

Preface to the Second German Edition

Functional kinetics has made pleasing progress in the past few years. The number of people interested in further training in functional kinetics, the need to train instructors, and the recent appearance of functional kinetics on the basic training curriculum at many schools of physiotherapy mean that a clear presentation of this method is now needed that will help students towards observation and a treatment-oriented understanding of movement. To this end, the basic textbook, *Funtional Kinetics,* essential to an understanding of *Therapeutic Exercises,* was reissued in 1984 in a third, fully revised edition.

The analytical concept "actio-reactio, conditio-limitatio" has continued to prove its worth in *Ball Gymnastics in Functional Kinetics* (second edition 1985) and is beginning to become generally accepted. The movement analyses in this new edition of *Therapeutic Exercises* have therefore been revised in accordance with this concept. New exercises have been added: in particular, the treatment of posture-related syndromes of the vertebral column has been expanded and completed with a detailed and systematic presentation of the techniques of lift-free/reduced lift mobilization of the joints, especially those of the vertebral column, and mobilizing massage of the lumbar, thoracic and cervical areas.

The reward for all this work is that it is possible, using these movement analyses, to adapt every exercise and technique individually to each patient. Because the point of reference is always the normal movement behaviour of a healthy person, exercise programmes geared to particular pathologies become superfluous, and the danger of schematic treatment of a person, turned by the circumstance of illness into a patient, is avoided. The complexity of these movement analyses, on the other hand, is unavoidable – for normal movement is extremely subtle and finely differentiated.

This book is intended as the basic textbook for introducing functional kinetics into physiotherapeutic practice. For this reason an extensive reference list seemed unnecessary.

My warmest thanks are owed to Springer-Verlag for sympathetic guidance and collaboration, especially from Bernhard Lewerich and Ilse Wittig of Medical Editorial and J. Sydor of Book Production. Sincere thanks go also to Katrin Eicke-Wieser, who read

through the whole manuscript with great care; her constructive criticism corrected many oversights and improved the clarity of the text in many places.
In addition, I should like to thank the models, Vreny Lüscher, Beatrix Lütof-Keller, Margrit Meier-Waldstein and Isabelle Gloor-Marconi, the photographer, Dietmar Hund (Kantonsspital Basel), Foto Fetzer (Bad Ragaz), Foto Zimmer, Cécile Zimmer (Basel), and the graphics artist, Holger Hammerich (Basel).

Basel, June 1986 Susanne Klein-Vogelbach

Preface to the First German Edition

A normal child learns during the early years of its life how to walk, talk and use its hands. For this it needs no other teacher than its environment, which allows the child to develop according to its own natural tendencies and the stimuli around it, and, through endless repetition, to organize the messages it receives. If the child wants to acquire particular skills, however, such as playing a musical instrument, hard work and endurance are needed, and, if possible, a competent teacher. But these alone are not enough to achieve the exceptional. The potential contained in the child's innate gifts also defines the child's limits and possibilities. There are many ways of fostering talent, but none of creating it.

A patient doing a Therapeutic Exercise for medical reasons finds himself in the position of wanting to acquire a physical skill for which he has no talent. In other words, even the ideal, most cooperative, best motivated patient, no matter how hard and determinedly he works, will be able to achieve no better than a "good average" with his Therapeutic Exercise. In therapy he will have to come to terms, perhaps for the first time consciously, with a painful discovery: that things that one finds difficult because one has no talent for them, and which one – for whatever reason – tries hard at, never earn much praise from comparative criticism, while things that one finds easy, having a gift for them, earn admiration and are often praised even when one puts no particular effort into them.

Being confronted in therapy with his own difficulties in movement, the patient finds that he has to learn by self-experience to recognize and demand his own best, within the range of his own possibilities. Comparisons with "the others", whom he perhaps admires and envies, are something he has to accept and cope with.

The therapist, on the other hand, should be able to give a just evaluation of the patient's achievement. She knows how much continuous effort and patience he has to put into reducing the gap between his motor behaviour and the "good average". That hard work deserves praise and confirmation, and the therapist is the person of reference who should provide both. Pleasure in the confirmation he has earned and honest assessment of his motor behaviour will help the patient to both learn and perceive more quickly. When he perceives and understands his motor behaviour, he will find it ea-

sier to accept his handicap with equanimity. If this self-motivation succeeds in firing the patient to work constantly at his motor behaviour, he will also find the way to plan and shape his own reality economically and to live it with his own particular vitality.

Basel, February 1978 Susanne Klein-Vogelbach

Contents

Note on Pronouns

For clarity and brevity, "she" has been assigned to the physiotherapist throughout, and "he" to the patient.

Definition

Therapeutic Exercises are carefully targeted and planned sequences of movement or of changes in activity designed to demarcate and isolate a defined functional deficit in motor behaviour in such a way that avoidance mechanisms are ruled out and the desired function necessarily arises in response to a clear stimulus.

Note

- A Therapeutic Exercise is useful if, through being performed with precision, it achieves its goal.
- All Therapeutic Exercises need to be made automatic by frequent repetition.
- Regular repetition of a Therapeutic Exercise once automated reduces the functional deficit.
- The self-monitoring required of the patient in Therapeutic Exercises, by conscious awareness and perception of movements and activities, is quite high.
- Therapeutic Exercises are uncomfortable because they emphasize the weaknesses in motor behaviour.
- A badly performed Therapeutic Exercise is useless and may even be harmful.
- It is characteristic of Therapeutic Exercises that they can rarely be performed spontaneously.

General Introduction

The goal of this book is to enable the therapist to set up instructions for model Therapeutic Exercises that solve a defined movement problem and can in addition be varied in adaptation to the patient's constitution and condition.
The path towards this goal starts with definition of the movement problem, by determining the patient's "functional status". If the damage to the motor behaviour is reversible, the therapist aims at regaining normal motor behaviour. If the damage is irreversible, she aims at the best compromise possible. The next step is to choose as a model a Therapeutic Exercise suitable for resolution of the defined functional problem.
Functional movement therapy can also take the form of *manipulation.* There are many kinds of manual techniques. A physiotherapist should have as many of these as possible at her command, so that she can choose one specifically for each patient or combine several techniques. Manual techniques are used to try to elicit particular functional reactions from the patient. Sensitive manipulation gives the patient training in kinaesthetic and tactile perception, through which he experiences – i. e. feels – new movement situations. The success of these techniques depends chiefly on the professionalism and craftmanship of the therapist. Therapy should start to show success before the end of the treatment period.
Manipulation has various forms, for example:
- Manual working of tissues
- Resistance offered by the therapist, allowing the patient to hang from her
- Support offered by the therapist, allowing the patient to use her as a support area
- Manipulation by the therapist of a change in the position of the patient's axes of movement in relation to gravity.

Functional movement therapy can also take the form of *verbal instruction.* The therapist must have an understanding of how to teach by verbal instruction. Whether she has this or not will be shown by whether she succeeds in eliciting the movement she wants and – what is more important – in winning the patient's cooperation in doing so.
Training the patient's perceptive capacities is essential for his self-experience of his own body in movement and at rest. This is the key to motivation of the patient and thus also essential for precisely targeted movement therapy. The less a patient realizes his movement deficit, and the less pain he has, the more difficult it is to motivate him in therapy.
Obviously, the manipulative and verbal methods of movement training are insep-

arable and often overlap. As long as the therapist continues to work with the patient, she will always be using both.

Principles of Movement Training

- A person's motor behaviour reflects both his physical and his psychological condition.
- Normal motor behaviour is beyond the conscious control of the individual.
- The attempt to consciously control or direct motor behaviour results in hyperactivity and may easily lead to tenseness of posture and movement.
- Posture is affected by many things. It is on the one hand an expression of personality, but it also constitutes a complex reaction to a multitude of influences from the environment.
- Sequences of movement can be practised. Obviously, a person is always practising movement as long as he goes on moving. All the therapist has to do, therefore, is to direct this constant practice into the right channels.
- Posture is a physiological and psychological phenomenon. All normal people have a natural talent for posture and movement. This talent is best trained by specific, finely differentiated processes of perception. The patient therefore has to be motivated to self-education through self-experience in motor behaviour. What will win him over is discovering, first, that he has a talent for movement, secondly, that practising movement can be fun – even fascinating – and, thirdly, that he feels better for it.

Teaching the patient to enjoy practising posture and movement is a top priority for the therapist. Playing is fun, so she has to awaken the patient's sense of play.

The changes regarded as necessary in the patient's motor behaviour should be practised until the patient can reproduce them automatically. During the learning process, however, the control of the movements must be made conscious through appropriate perceptual signals. It is important for the instruction to appeal to movement reactions that are already tendentially present and can therefore be "called upon". How far this is successful depends on the therapist's ability to engage the patient's perceptual capacity, imagination and feel for melody and rhythm.

- The patient will recognize successful normalization of his motor behaviour as a kind of "anti-stress condition". This condition can only be called "relaxed" if that word is used to mean "*as much* or *as little* activity *as is necessary* for a particular posture or movement". This is the condition of economical activity.
- Having felt the condition of wellbeing which we have just defined as economical activity, and having acquired the ability to call up this condition, the patient feels a need to reproduce it when its loss forces itself upon his awareness through tension, pain, lack of strength or unexplained tiredness. The surest way to motivate a patient to self-education in motor behaviour is by helping him, via his potential for kinaesthetic and tactile perception, to experience economical activity in posture and movement.

Therapeutic Exercises

The first essential for successful therapeutic exercising is to choose a suitable Exercise as a model for the solution of the functional problem in hand and to adapt this model to the patient's *condition, constitution, postural statics* and *mobility.*
A functionally trained therapist will always know or be able to invent suitable models for Therapeutic Exercises once she has identified the existing functional problem.
A patient's somatic and psychological *condition* will alter during the course of treatment. For this reason, one must always be prepared to readapt the exercise. Functional therapy of patients who have recently undergone surgery or are suffering acute pain or are in a state of depression will be different to the therapy given at a later point when the patient's condition has changed. A major change in weight, growth in a child or adolescent, or the ageing process can all have a considerable effect on movement sequences.
The patient's *constitution* is a constant, requiring, if any, a basic, once-for-all adaptation of the exercise to the patient.
The way in which the patient's *postural statics* deviate from the norm show the "deficit" in his motor behaviour. This "deficit" is the visible functional problem to be treated.
Mobility has constitutional and conditional elements which must be registered separately. *Constitution* governs the patient's general mobility, while *conditional* elements include the many possible pathological changes in motor behaviour. *Conditional and constitutional mobility* together determine the best variant of adaptation of the model of a Therapeutic Exercise. *Condition, postural statics* and *condition-determined mobility* – or restrictions of mobility – define the rate at which an exercise is taught and learnt: how big each step in learning is and how long is spent on one step before passing to the next. The therapist chooses her verbal and manipulative cues according to these considerations.

Setting Up a Therapeutic Exercise

This book shows you how to:
- Define Therapeutic Exercises by functional analysis
- Set out instructions for Therapeutic Exercises that can be followed by anyone interested in doing so.

■ Goal of the Exercise

Resolution or partial resolution of the defined functional problem and incorporation of the individually adapted Exercise into the patient's motor behaviour.

▶ Functional Analysis in Therapist Language

- **Conception of the Exercise**

- **Position and Activation in the Starting Position**

Position in space of the critical axes
Points of contact between the body and the environment
Components of movement in relation to the neutral position of the joints

Movement tolerances at the critical joints in relation to the intended primary movement

Distribution of body weight on a base support or suspension device, against a supportive device, or over a support area, and the resulting activity states of the musculature

Intensity of muscle activity required with economical activity; respiration

Potential accelerating and braking weights in relation to the intended primary movement

- **Actio–Reactio of the Movement Sequence**

Actio: The primary movement
Reactio: Activated passive buttressing
Reactio: Change in the support area

Actio: Accelerating weights
Reactio: Braking weights

- **Conditio–Limitatio of the Movement Sequence**

Conditio: Constant distances between body distance points
Limitatio: Active buttressing and stabilization

Conditio of absolute and/or relative fixed spatial points
Limitatio through limiting the primary movement, activated passive buttressing and/or change in the support area

Conditio of movement speed
Limitatio of economical activity by finding the optimal speed

- **Position and Activation of the End Position and Return to the Starting Position**

▶ Instruction in Patient Language

- **Instruction Appealing to the Patient's Perception**
- **Verbal Instruction**
- **Instruction by Manipulation**

▶ Adapting the Exercise to the Patient's Constitution and Condition

- **Adaptation to Constitution: Role of Lengths, Widths, Depths and Distribution of Weights**
- **Adaptation to Condition**

Poor physical fitness or wish to increase performance

Pain arising during the exercise a contraindication

Muscular weakness or depressed reactivity; adaptation of lifting strain and/or extent and/or speed of movement

Restricted movement or hypermobility

Movement disorders originating in the central nervous system

1 The Frogs: Functional Training of the Abdominal Muscles

Functional training of the abdominal muscles activates the abdominal muscles as for their normal physiological function.

Note
Functional training of the abdominal muscles is not training for strength through the employment of drastic increases in load (e.g., lifting the extended legs from supine), but a method of training in fine skill through the economical employment of strength at the right moment.
The goal is for the abdominal muscles to contract according to the following functional principles:
- When the upper abdominals contract, the epigastric angle should narrow but the distance from distance point (DP) navel to DP xiphoid process remains the same. The *upper abdomen becomes narrow.* The activity of the oblique abdominal muscles pulls the ribs down. This necessitates active buttressing by extensional stabilization of the thoracic spine in the neutral position.
- When the lower abdominals contract, the distance from DP navel to DP symphysis becomes shorter. The *lower abdomen becomes short.* The activity of the rectus abdominis muscle causes the lumbar spine to flex, enhancing the motive components of these muscles.

Functional training of the abdominal muscles requires the involvement of all the numerous switchpoints of movement affected by the activity of these muscles.

Function of the Abdominal Muscles

The abdominal muscles regulate pressure inside the abdomen:
- They should be able to react to different abdominal contents, e. g., the fetus during pregnancy, adipose tissue in cases of obesity, or food during digestion.
- They should be able to compensate for constitutional variations of the shape of the pelvis and lumbar spine and for postural variations of the position of the pelvis in the hip joints.

The abdominal muscles are involved in respiration :
- During inspiration, the increased tone in the abdominal wall acts as a buttress against the diaphragm as it flattens out by contraction in the subphrenic space.