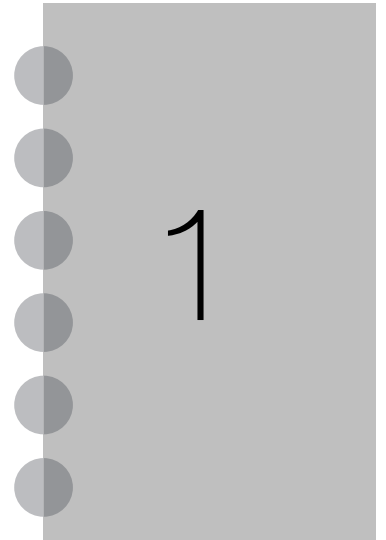


Introduction



This book explores how manual and physical therapists can help individuals to recover and optimize their control of movement. Musculoskeletal injury, pain experiences and central nervous system damage are all associated with diverse neuromuscular and movement control changes. The aim of this book is to provide the theoretical and practical basis for neuromuscular rehabilitation for these conditions.

This book is intended for manual and physical therapists of all disciplines (physiotherapists, osteopaths, chiropractors, sports massage therapists, etc.) who work with patients whose conditions involve the neuromuscular system. The book will also be useful for personal trainers, Alexander method teachers, Pilates instructors, postural integration teachers, Rolfing practitioners, sports trainers and individuals who experience losses in movement control.

A functional approach in rehabilitation

A functional approach in rehabilitation is the key concept underpinning the management described in this book.

Functional movement is defined here as *the unique movement repertoire of an individual*. A portion of this repertoire involves the movement behaviour associated with daily needs and demands, such as feeding, grooming, going places, etc. (*general skills*). Some movement behaviour may be partly shared with others whilst some may be unique to particular individuals; examples include physical hobbies, sports and occupational activities (*special*

skills). For one person their functional repertoire may include playing tennis, for another standing on their head (yoga) or playing the piano and so on. Once a person learns a movement or a new skill it becomes a part of their movement repertoire and, therefore, their behaviour. Movement which is outside the normal repertoire of an individual will be termed here as *extra-functional* (Fig. 1.1).

Functional rehabilitation is defined here as *the process of helping a person to recover their movement capacity by using their own movement repertoire (whenever possible)*. Hence, for a person who has motor losses at the knee and is unable to walk or run, the rehabilitation will be in walking, then running, jumping and stair-climbing, etc. If this person plays tennis, this activity will also be used in the rehabilitation programme.

However, rehabilitation is likely to be less effective if the remedial movement patterns or tasks are outside the individual's experience (extra-functional). For example, it would be less helpful for a tennis player with a leg injury to be given rehabilitative exercise such as football, or leg presses in the gym or leg exercise lying on the floor (Ch. 2). For this particular patient, rehabilitation that incorporates tennis tasks is more likely to be useful. For a person who is suffering from lower back pain and enjoys yoga, a functional rehabilitation would consist of the shared functional activities (general skills), but may also include some of the upright postures from yoga (special skills). A less suitable rehabilitation approach would be to prescribe tennis to this individual. This may seem obvious; however, movement rehabilitation often prescribes extra-functional tasks such as core stability training

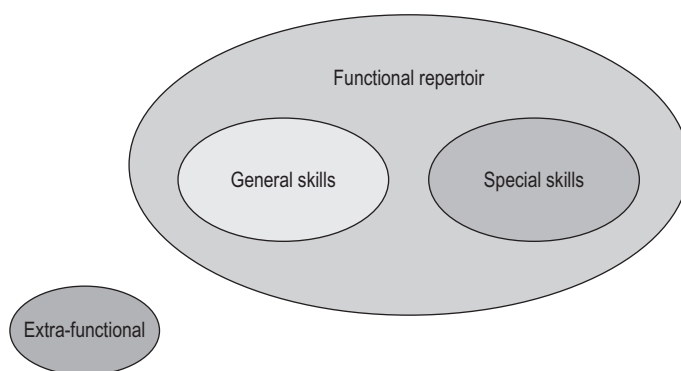


Fig. 1.1 • Functional movement represents the movement repertoire of the individual. It includes all the general activities and special skills. Extra-functional movement comprises all activities outside the individual's movement experiences.

on the floor, bracing the trunk or strength training with equipment. The question is how effective are these activities in recovering functional movement?

The introduction of extra-functional activities during rehabilitation raises some problems. Extra-functional activity or exercise requires learning a new task at a time when the patient is experiencing pain and/or loss of movement ability. This might not be the best time to enter a new exercise regime. Learning requires set-aside time, intense mental focus and physical effort. Often it means the patient has to be dependent on others for instructions and guidance during the training. A functional approach which aims to use the patient's own movement resources does not require additional learning; the cognitive demands are less taxing and do not require protracted training. Also the set-aside time for practice is more manageable for the patient. This form of rehabilitation seldom relies on any specialized exercise equipment and the remedial movement challenges are integrated into the person's daily activities. They can be practised anywhere and at any time. A functional approach is easy to apply and it empowers the patient to self-care.

There are exceptions to the functional approach in rehabilitation. There are circumstances where the patients will require specific exercises for particular motor losses; challenges which may not be provided by their functional repertoire. There are also situations where the individual is physically unable to perform functional activities. When and why the rehabilitation should stray from this model will be discussed throughout this book.

Rehabilitation levels: skill and ability level rehabilitation

Movement rehabilitation and motor normalization following injury occurs naturally for most individuals. Following injury most individuals will take physical actions that will support their spontaneous and unaided recovery. This would happen without any special knowledge or understanding of the underlying physiological principles underpinning their recovery. In this form of rehabilitation the individual is attempting to, partially or fully, execute the movement that has been lost. Attempting to walk becomes the rehabilitation for the person who lost the ability to walk. Similarly, if an individual with an arm injury is unable to reach; their repeated attempts in that pattern would often be their rehabilitation. The focus in this form of movement recovery is on the overall skill of performing the particular movement. This will be loosely referred to as *skill rehabilitation* (Ch. 9).

However, this approach does not always lead to the intended results. Individuals who are in pain or have motor losses may develop movement patterns that circumvent their losses. A patient may present with walking difficulties due to losses in the control of balance and coordination. One would imagine that by encouraging the patient to increase their walking, "walking would train balance and coordination during walking". However, what may happen is that the patient will get better at using their compensatory pattern; walking slowly, using wider gait,

shorter steps, rather than truly improving their control of balance and coordination during walking.

Balance and coordination are part of several control building blocks that make up skilled movement. These building blocks are called *sensory motor abilities*. A therapeutic approach that targets the various motor abilities will be termed in this text as *re-abilitation*. At this level of rehabilitation the aim is to recover control losses associated with particular abilities. Hence, in the walking scenario described above, the rehabilitation would aim to challenge balance and coordination in dynamic and upright postures (Ch. 2).

Skill rehabilitation and re-abilitation are both clinically important and are often used in combination. However, there may be a shift of focus towards one of these particular approaches depending on the individual's condition and their phase of recovery (Ch. 9).

The code for neuromuscular adaptation

Neuromuscular rehabilitation is a straightforward process – anyone can do it. Indeed, we all do it all the time. Every day we take actions that result in movement and behaviour changes; we can self-modify our motor control. Furthermore, the neuromuscular system has the capacity for self-recovery and to reorganize in response to injury. It means that within our behaviour there are certain elements that facilitate the recovery of movement control.

In functional rehabilitation we identify five such elements that optimize neuromuscular adaptation: cognition, being active, feedback, repetition and similarity (Ch. 5). Hence, in order to learn a new task, modify our behaviour or help our system recover we need to be aware of what we are doing (cognition) and we have to actively perform the action that we aim to recover (being active). In order to correct our movement we rely on internal information from our senses or depend on guidance by someone (feedback) and we have to practise the task many times (repetition). Furthermore, the practice has to closely resemble the movement we aim to recover (similarity). Hence, to play the piano a person needs to practise the piano. However, strength training with finger weights or practising push-ups is unlikely to benefit playing the piano. The practice has to be task-specific.

The recovery of motor control can be facilitated by introducing the adaptive code element into the rehabilitation programme. It will promote a functional recovery that is more likely to benefit the patient in their daily activities. The results are more likely to be maintained in the long-term and could help to reduce the overall duration of the treatment programme.

Developing a neuromuscular rehabilitation programme

Much of the rehabilitation promoted in this book is the marrying of the three concepts discussed so far:

1. The focus on functional movement
2. The principle of skill/ability level rehabilitation
3. The code for motor adaptation (Ch. 9).

Through a simple three-step process the therapist decides which level of rehabilitation will be used and applies the motor adaptation elements to the treatment programme. Many of the remedial challenges are selected from the patient's own movement repertoire. It really is that simple.

The beauty of it all is that these principles can be applied to any condition in which the neuromuscular system is implicated:

Conditions with an intact motor system

- Neuromuscular changes associated with musculoskeletal injuries, sports injuries, post surgery, back pain and other musculoskeletal pain conditions (Ch. 7)
- Conditions where certain behaviours impede recovery or may lead to injury or pain (Ch. 8)
- Non-traumatic pain conditions, such as trapezius myalgia, chronic neck pain and painful jaw (Ch. 9).

Conditions where there is damage to the central nervous system

- Stroke, head trauma and post central nervous system (CNS) surgery and all the degenerative conditions (Ch. 10).

The main difference in managing these conditions is in the magnitude of losses, the duration of recovery and the extent of potential recovery.

Summary points

- Neuromuscular rehabilitation aims to help the individual recover their movement control.
 - Functional movement is the movement repertoire of an individual.
 - Functional movement is individual-specific.
- Functional rehabilitation uses the patient's own movement repertoire to help him/her to recover their movement losses.
 - The rehabilitation promoted in this book has three basic recurring concepts:
 1. It aims to be functional.
 2. It uses the skill/ability level rehabilitation concept.
 3. It uses the learning/adaptation code to optimize motor control changes.