

Neuromuscular rehabilitation: summary

- Neuromuscular rehabilitation aims to help the individual to recover their movement control and optimize their functional capacity.
- It is an inclusive approach that encompasses the cognitive, behavioural and neurophysiological dimensions of the individual.
- The rehabilitation promoted in this book has three basic recurring concepts:
 - It aims to be functional
 - It involves skill/ability-level rehabilitation
 - It uses the learning/adaptation code to optimize motor control changes.
- Skill is how proficient a person is in performing a particular task.
- Skill depends on practice and a mixture of the sensory-motor and cognitive abilities of the individual.
- Motor abilities are the various control factors that underlie movement.
- At skill-level rehabilitation the patient simply aims to carry out the movements they are currently unable to complete.
- Ability-level rehabilitation (re-abilitation) focuses on specific underlying motor losses which prevent the person from attaining their movement goals.
- Cognition about injury and pain, persistent pain and fear of it, and behavioural factors, are all manageable within skill-level rehabilitation.

Functional rehabilitation

- *Functional movement* is the movement repertoire of an individual.
- Movement which is out of the individual's experience is termed *extra-functional*.
- Functional rehabilitation utilizes the patient's own movement repertoire to help them to recover their movement losses. It uses actions the patient is already familiar with but can't carry out.
- Extra-functional movement requires a period of learning/training and is, therefore, not ideal for individuals who are in pain or recovering from an injury.

Skill/ability-level rehabilitation

- Neuromuscular rehabilitation can be within a skill and/or ability level.

The code for neuromuscular adaptation

- Learning, retraining, motor organization to injury and return to functionality depend on the capacity of the motor system to adapt.
- These adaptive processes can be optimized by introducing five principal elements: cognition, activity, feedback, repetition and similarity.
- Cognition involves thinking, rationalizing, memorizing, focusing, being attentive, deciding on actions and understanding the aims and goals of the rehabilitation process.

- Being physically active is important for neuromuscular adaptation. Passive movement approaches are unlikely to be effective in promoting lasting and functional motor control changes.
- Feedback can be intrinsic from proprioception or extrinsic as guidance from the therapist.
- Repetition, repetition, repetition – practice is very important for long-term memory.
- Rehabilitation should use movement patterns that are similar to, and within the context of, the movement being recovered.
- Experiences that possess a higher content of adaptive code elements have a greater potential for promoting long-term changes.

Motor abilities

- Motor abilities can be classified according to their level of motor complexity: parametric, synergetic and composite abilities.
- Parametric abilities are: force, velocity/speed/rate, length, endurance.
- There are two identifiable synergistic control patterns: reciprocal activation and co-contraction.
- Composite abilities are: coordination (fine, single- and multi-limb, and body coordination), balance/postural stability, transition time and motor relaxation.
- Motor ability changes can be observed in musculoskeletal injuries and pain conditions and in patients suffering from central nervous system (CNS) damage.
- There is evidence that motor abilities can be normalized by activities that challenge them specifically.

Sensory ability

- The sensory-motor system is a functional unit.
- Proprioceptive acuity can be affected due to peripheral and/or central causes.
- Musculoskeletal injury can affect the peripheral proprioceptive apparatus while CNS damage will affect the central processing of proprioception.
- Recovery of proprioception comprises both reparative and adaptive processes. As such, it

- may have its own inherent recovery period that may take several weeks or months to complete.
- Promoting normal functional movement will help proprioception by facilitating positive sensory-motor reorganization/adaptation. There is no need to specifically target proprioception.
- All exercises are proprioceptive exercises.

The motor system in musculoskeletal injury

- The motor reorganization following injury is a multi-dimensional strategy culminating in postural and movement reorganization aimed at reducing the mechanical stresses imposed on the damaged tissues – in this text it is referred to as *the injury response*.
- The injury response is a positive healthy response and not a motor dysfunction or pathology.
- Acute musculoskeletal injuries should be left alone – the body knows best. The patient should be encouraged to keep active.
- Neuromuscular rehabilitation is useful when the injury response serves no obvious protective function. It includes:
 - Conditions where the injury response has become an adaptive state, such as in chronic recovery from injury or surgery, or conditions where there were movement constraints or immobilization
 - Sensitization conditions where tissue damage has resolved but the patient still experiences pain
 - Injury-related psychological distress that leads to “psychomotor” control losses.
- In the neurological dimension there is no injury specific rehabilitation. A body area is rehabilitated according to its function rather than to the underlying pathology.

Cognition and behaviour

- Cognition, behaviour and movement control are inseparable.
- Helping individuals to modify their injury behaviour and challenging beliefs and attitudes about their condition can facilitate motor recovery.

- Some injuries and pain conditions can be acquired by the way the person uses their body in relation to the physical environment (task behaviour), or by the way in which the person organizes and schedules their physical activities (organizational behaviour, often overuse injuries).
- Guiding individuals in how to modify their task and organizational behaviour could help to prevent musculoskeletal injury and pain.
- Movement control can change solely by cognitive means.
- The rehabilitation plan should contain the motor adaptation elements – cognition, activity, feedback, repetition and similarity.
- Keep the training as close as possible to daily functional movement.
- Avoid complex movements that are not within the normal movement repertoire of the individual – train them in something they already know (but can't do).

Non-traumatic pain conditions

- Individuals may acquire painful musculoskeletal conditions without traumatic injury.
- Often these conditions develop in low-load, repetitive physical activities (computer use) or in response to psychological distress.
- These conditions often manifest as pain and tender points around the head (tension headache), suboccipital area, neck and neck-scapular muscles (trapezius myalgia) and jaw (bruxism).
- All these conditions share similar processes – inability of the individual to relax, transmission of tension via the neuromuscular system to specific muscles.
- Intervention should be all-inclusive – a combination of cognitive, psychosocial, behavioural, organizational and neuromuscular approaches.
- Focused motor relaxation should be used to train the individual how to relax their painful muscles.
- Transferring the relaxation to functional daily activities is important. Promote relaxation-in-movement.
- The patient's own coping strategies are very important for reducing stress and chronic states of arousal.
- Neuromuscular rehabilitation is also about motor relaxation.

Damaged central nervous system

- Many of the principles of neuromuscular rehabilitation can be applied to managing individuals who suffered CNS damage.

Further thoughts on motor recovery

- Recovery of motor control is an intrinsic person/nervous-system process.
- This recovery is dependent on psychological, behavioural, neurophysiological and tissue-related factors. Often many of these factors are interrelated.
- The role of neuromuscular rehabilitation is to optimize the recovery of movement control, working with all these factors.
- Rehabilitation is more about facilitating cognitive-sensory-motor processes by providing a stimulating and variations-rich environment. It is not just exercising.
- The movement challenges should be introduced at a level that matches or is above the patient's movement capacity.

Finally

- The only clinical certainty is uncertainty – don't fight it, learn to work with it. You will never know all the answers but you will be expected to provide expert care.
- Complexity rules! Don't become lost in the labyrinth of the neuromuscular system; look at the whole, not at minute details.
- Neuromuscular rehabilitation is a creative process; it is not protocol-based. Every patient is different and presents with new challenges. You will forever have to problem-solve on your feet.
- *Think movement not muscles.*
- There is nothing like one brain to stimulate another.
- Make it fun, interesting and continuously challenging.

