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Masterclass

Osteopathic neuromuscular re-abilitation

Eyal Lederman*

Centre for Professional Development in Osteopathy & Manual Therapy, 15 Harberton Road, London N19 3JS, United Kingdom

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ABSTRACT

This article explores osteopathic neuromuscular re-abilitation (ONR) and exemplifies the use of the approach through a case study. The aim of ONR is to help individuals recover and optimise their control of movement after musculoskeletal injury, pain conditions or central nervous system damage.

1. Background

Osteopathic neuromuscular re-abilitation (ONR) was developed by Lederman[1] at the British School of Osteopathy in the early 1990s. It originated from a doctoral research project in collaboration with the physiotherapy school at King's College, London.[2] The study examined the effects of manual therapy on motor control.

The development of ONR was in response to emerging knowledge that musculoskeletal injury, pain experiences and central nervous system injury are all associated with diverse neuromuscular and movement control changes. It was also evident that these central processes are well buffered against passive external influences.[3] Osteopathy was, and still is, dominated by passive manual approaches and low level active engagement of the patient outside the treatment session. These approaches have little or no lasting effect on movement control and neuromuscular recovery.[4] ONR was developed from this clinical need to provide a therapeutic solution to an area that has received little attention within osteopathy.

2. A functional approach

One of the key principles in ONR is the use of functional movement to help recover motor losses.

Functional movement is defined in ONR as *the unique movement repertoire of an individual*.[4] Some of this repertoire is the movement behaviour associated with daily needs and demands such as feeding, grooming, going places, etc (*general skills*). Some of this repertoire is partly shared by others and some may be unique to particular individuals; they include physical hobbies, sports and occupational activities (*special skills*). For some people, their functional repertoire will 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 is termed in ONR as "*extra-functional*" (Fig. 1).[4]

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)*.[4] Hence, for a person who has motor losses at the knee and is unable to walk or run, the rehabilitation will use gradual exposure which may begin with walking, then running, jumping and stair-climbing, etc. If this person plays tennis, this activity will eventually be added to the rehabilitation programme.

However rehabilitation is likely to be less effective if the remedial movement patterns or tasks are outside the individual's movement 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. 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 skill) but may also include some of the upright postures from Yoga (special skills). A less suitable rehabilitation approach would be to prescribe tennis, an extra-functional task, to this particular individual. This may seem obvious; however,

* Tel.: +44 0207 263 8551.
E-mail address: cpd@cpdo.net

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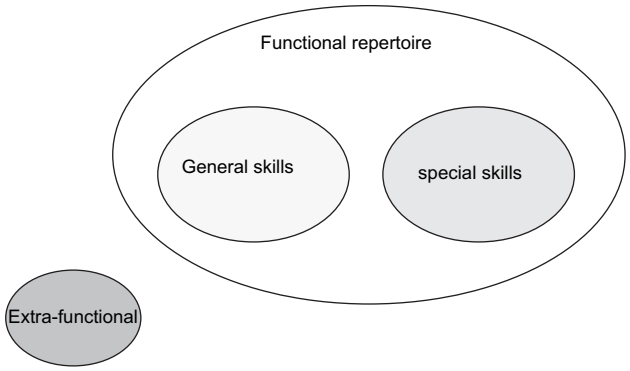

Fig. 1. Functional movement represents the movement repertoire of the individual. It includes all the general activities and special skills. Extra-functional movement is all activities outside the individual's movement experiences. (With permission Lederman E 2009 (to be published) Neuromuscular rehabilitation in manual and physical therapy. Elsevier, Edinburgh).

movement rehabilitation often prescribes extra-functional tasks such as core stability training on the floor, bracing the trunk or strength training with equipment. The question is how effective these activities are in recovering functional movement.

The introduction of extra-functional activities during rehabilitation raises some problems. Extra-functional activities or exercise require learning a new task at a time when the patient is experiencing pain or loss of movement ability. This might not be the best time to enter a new exercise regimen. Learning requires set-aside time, intense mental focus and physical effort. Often it means the patient has to depend 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. Furthermore, the rehabilitation programme seldom relies on any specialised exercise equipment. The remedial movement challenges are an integral part of the person's daily activities and, therefore, 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 patient will require specific, extra-functional exercises for particular motor losses. This would be useful in situations where the individual is physically unable to perform functional activities. This could be in patients who had surgery or are suffering from CNS damage that limits their functional repertoire.

3. Rehabilitation levels: skill and ability level rehabilitation

Movement rehabilitation and motor normalisation following injury occurs naturally for most individuals. Following injury most humans will take physical actions that will support their spontaneous and unaided recovery. This can 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 has 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*.[4]

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. Using the similarity principle, 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.[5] These building blocks are called *sensory-motor abilities*. A therapeutic approach that targets the various motor abilities is termed "*Re-Abilitation*".[4] 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 (Fig. 2). The different motor abilities are described in Table 1.

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.

4. 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 reorganise in response to injury. It means that within our behaviour there are certain elements that facilitate the recovery of movement control.

There are five elements that can help optimise neuromuscular adaptation (Fig. 3)[1,4]:

- cognition,
- being active,
- feedback,
- repetition,
- and similarity.

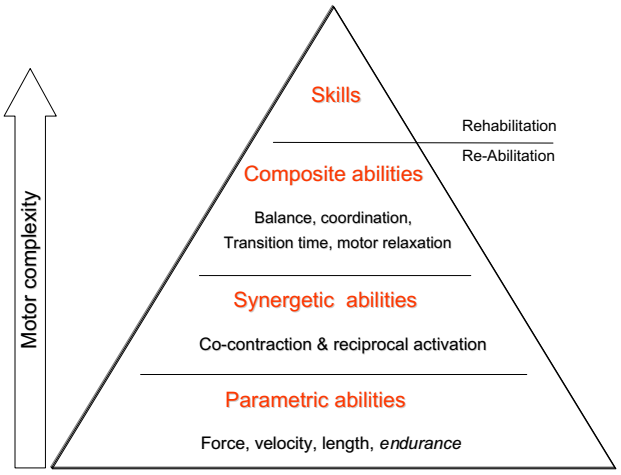

Fig. 2. The motor complexity model including some of the motor abilities underlying movement control. (With permission Lederman E 2009 (to be published) Neuromuscular rehabilitation in manual and physical therapy. Elsevier, Edinburgh).