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Global Outlook in to Motor Control

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Abstract

This review describes about motor control approach. Indications, rationale, stages, uses and procedure of motor control exercises is explained in detail. Also motor control Mechanism is important to understand as it explains the need of motor control exercises in physiotherapy.

Keywords: Motor control; Exercise; Strength.

INTRODUCTION

The motor control exercise program was based on the treatment program reported by Hodges *et al.* and similar to the protocol previously used by Ferreira *et al.* and Costa *et al*.

Motor Control Exercise: Treatment Rationale

The use of motor control exercise depends on research that has shown:

(i) People with low back pain have modifications in the strategy for controlling the trunk muscles in that deep muscle activity is hindered (delayed, less tonic) and these muscles have atrophied.[1]

(ii) Though all muscles aid in spinal movement and stability, the deep muscles play a key role in controlling intervertebral motion, with the added benefit of providing dynamic spinal control.

(iii) Evidence that people with back pain tend to adopt a strategy for increased stiffness and stability at the expense of spinal function.

(iv) Recurrences of low back pain are associated to non-resolution of alterations in the deep muscular system.

The exercise's primary purpose was to help the patient regain the control and balance of the spine and pelvis by utilising motor learning concepts such as subdivision and simplicity. The approach was based on an evaluation of the individual participant's motor control deficits and treatment goals (established cooperatively with the therapist).[1]

The key feature of the motor control exercise approach is the training of the deep trunk muscles in isolation before progressing to demanding tasks that train coordination of the deep and the superficial trunk muscles. However, unlike functional restoration approaches, training the deep trunk muscles in isolation from the superficial trunk muscles is difficult. In order to educate patients how to engage the deep muscles of the spine, physiotherapists must use equipment such as pressure monitors, electromyography, and ultrasound imaging in addition to clinical skills of touch and observation. The evidence above underpins the primary aim of motor control

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exercise, which is to re-establish normal control of the deep spinal muscles, reducing the activity of more superficial muscles that tend to stiffen the spine and have increased activity in low back pain, and then maintain normal control during progressively more demanding physical and functional tasks.[2]

Stages

The first stage of treatment included assessing the positions, movement patterns, and muscle activation associated with symptoms and implementing a retraining programme designed to improve activity of muscles assessed to have poor control (commonly, but not exclusively, the deeper muscles such as transverses abdominis, multifidus, pelvic floor, and diaphragm) while decreasing activity of any muscle identified to be hyperactive, commonly the large, more superficial trunk muscles such as the obliquus externus abdominis. Participants were taught how to contract trunk muscles in a specific manner and progress until they were able to maintain isolated contractions of the target muscles for 10 repetitions of 10 seconds each while maintaining normal respiration. Feedback such as palpation and real-time ultrasound images were available to enhance learning of the tasks. During this stage, additional exercises for breathing control, posture of the spine, and lower limb and trunk movement were performed.[3]

The second step of treatment entailed progressing the exercises towards more functional tasks, first with static tasks and later with dynamic tasks. The recruitment of trunk muscles, position, movement style, and respiration were all assessed and addressed during this procedure. Unlike the graded activity programme, motor control exercises were directed by pain, and they were usually pain-free.[4]

Uses

The motor control technique is based on the notion that simple functional training alone does not restore trunk muscular coordination. This notion is confirmed by the discovery that the responses of these muscle groups to pain persists after patients have recovered from a bout of back pain and restored to normal performance levels. Furthermore, recent data confirm that coordination of the abdominal muscles can be restored with training of specific activation of the trunk muscles, but not a simple activation during a sit up task. Notably, non-resolution of muscle dysfunction is associated with increased back pain recurrence. Also, asymptomatic people with normal activity levels who are unable to perform a task that is thought to reflect voluntary activation of the deep trunk muscles, are ~ 6 times more likely to develop back pain than asymptomatic people who are able to perform the same task.[5]

Procedure

Train the specific contraction of the deep abdominal muscles, without substitution from large torque producing muscles such as rectus abdominis and external oblique, using the abdominal drawing in maneuver described by Richardson and Jull.

The holding time for these exercises was increased gradually, in conjunction with a pressure bio feedback monitor, to the point where patients were able to perform 10 contractions with 10-second holds. It was stressed that these exercises are precise isometric contractions involving low levels of maximum voluntary contraction, to ensure that subtle patterns of muscular substitution were prevented. Once an accurate and sustained contraction of these muscles was achieved, the exercises were progressed by applying low load on the muscles by means of adding leverage through the limbs.[4,5]

Subjects were required to perform the exercises at home on a daily basis. The exercise programme was planned to last about 10 minutes. Subjects additionally finished an everyday activity sheet to track their progress. Once the cocontraction sequences were accurately activated without synergistic replacement they were readily adopted into useful retaining positions and tasks known to previously aggravate the subject's symptoms. Subjects were encouraged to activate these muscles regularly during daily activities, particularly in situations where they anticipated or experienced pain or felt unstable.[4,5]

This aimed to enhance the dynamic stability of the lumbar spine in a functionally specific manner for each individual. In a practical sense, if the subject complained of the onset of symptoms in sustained positions such as sitting and standing, they were trained to perform a gentle sustained co contraction in these positions throughout the day. If, however, the complaint was an arc of pain during lumbar flexion, co-contraction was initiated during this movement pattern. The same was the case for twisting of the spine and extension activities. Once proper activation was taught during active movement tasks, this pattern was adopted into mild aerobic activity such as walking

and previously unpleasant daily living activities at the speed required.[3,4,5]

MECHANISM

When there is mechanical neck pain, there is inhibition of local stabilizers Rectus Capitus Anterior (flexor), rectus capitus posterior and obliques (extensors), compensation by global stabilizers Longus colli and capitus, semispinalis, axioscapular muscles like serratus anterior and trapezius muscles.

When there is mechanical back pain, there is inhibition of local stabilizers transverses abdominis (flexor), multifidus (extensor), compensation by global stabilizers. (obliques-internal and external), hip muscles like gluteus maximus, gluteus medius, minimus, psoas, adductor magnus, brevis, pectineus.

Global stabilizers issues impaired proprioception, movement control impoairment, stress on articular and myofascial structures, cumulative micro inflammation gives pain.

It is replaced by global mobilizers – Neck pain sternocleidomastoid, scalene (flexor), semispinalis (extensors) Lumbar pain rectus abdominis (flexor), erector spinae (extensor), hamstrings, quadratus lumborum, tensor fascia lata Global mobilizers issues not able to sustain task for a long period of time, spasm of mobilizers leading to pain.

Management: (1) Low load precision activation of local stabilizers and global stabilizers, axioscapular and lateral trunk and hip muscles (2) Restoration of global muscle control and muscle balance on movements related to neck and back, release of overactive tight muscles global mobilizers. (3) Integration in to functional tasks progression to advanced mobility and strength activities.

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