



Faber & De Jager Biokinetics

Exercise Components:

Biokinetics is the Science of movement and the application of exercise in the rehabilitative treatment, with the primary function to improve the functionality and health of patients through exercise in the final rehabilitative phase, by means of scientific based exercise program prescription (ExRx).

During the rehabilitative process there are specific components that are addressed to assist in the healing process of orthopaedic or acute injuries which include:

- *Controlling pain*
- *Establishing core stability*
- *Re-establishing neuromuscular control (NMC)*
- *Restoring postural control and stability (Balance)*
- *Restoring flexibility and range of motion (ROM)*
- *Restoring muscular endurance, strength and power*

It is important to mention that these components are optimally achieved through the combined efforts of a multidisciplinary team.

Controlling pain

Pain can differ in type and intensity, depending on the severity of the injury and the structure injured. Persistent pain can make strengthening or flexibility exercises difficult and therefore must be the primary focus of treatment before the other components can be addressed. Modalities such as PRICE, TENS and medications (NSAIDS) can be used to treat pain.

Pain can also occur in tendons and joints due to bad posture, weak muscles and incorrect muscle firing patterns. Teaching these patients correct static and dynamic posture, activating and strengthening weak muscles and optimal tendon loading can assist with pain relief.

Establishing core stability

Core stability is essential to every aspect of the rehabilitation process, it functions to dynamically stabilize the entire kinetic chain during movement. Most activities/sports are performed with the upper and lower body and without proximal or core stability the distal movers can't function optimally and can lead to injury. Strengthening the core can also assist with pain relieve in medical conditions such as non-specific lower back pain.

A comprehensive core strengthening program must be designed and progressed in a systematic pattern from a static posture in a seated, standing or lying down position and progressed to complex tasks were the core is active in all planes of movement with high performance demands.

Here are some verbal cues you can follow to activate your core:

- Draw your naval back to your spine without moving your spine.
- Narrow your waist.
- Pull your stomach away from your pants' waistband.
- Simulate zipping up your pants and at the same time pull in your abdomen.
- Woman: Tighten your pelvic floor as though you really want to go to the restroom.
- Men: Imagine walking waist deep into cold water.

Re-establishing neuromuscular control (NMC)



After injury and a period of immobilization the central nervous system (CNS) forgets how to put information together coming from muscles and joints. NMC relies on the CNS to interpret and integrate proprioceptive information and to control individual muscles and joints to produce coordinated movements through mechanoreceptors that are found in the muscles and joints. Re-establishing NMC is done throughout the rehabilitation process but is most important in the initial phases.

There are four elements that are important in re-establishing NMC:

1. Proprioceptive and kinesthetic sensation.
2. Dynamic joint stabilization.
3. Reactive NMC.
4. Functional motor patterns.

Making use of unstable cushions and resistance bands are some of the tools used to improve NMC.

As biokineticists one of our primary concern is to re-establish the Neuromuscular control through an individualized program prescription.

Restoring postural control and stability (Balance)



Suspension straps can be used to assist balance in the beginning and removed as balance improves. Airex pads, balance cushions, bosu balls and physio balls are also some of the equipment that can be used to increase the level difficulty of balance exercises.

Balance is the single most important element that determines movement strategies. Many make the mistake of thinking it is a static process when in fact it is a highly dynamic process and requires multiple neurologic pathways. Postural stability is created through the integration of complex muscle forces that work in coordination.

When the patient can bear full weight on the injured limb the first phase of postural control and stability can begin. In the second phase static balance exercises progress to dynamic movements and finally develop to activity and sport specific balance exercises.

Postural stability is important to acquire or reacquire complex motor skills. Failure to address balance problems can predispose the patient to reinjury.

Restoring flexibility and range of motion (ROM)



A goniometer is a tool that can be used to evaluate joint ROM and determine muscle or capsular stiffness.

Flexibility is defined as the ability to move a joint through a full, non-restricted, pain-free ROM. Loss of ROM and flexibility can be due to several pathological factors, including resistance from the musculotendinous unit, contractures of connective tissue or a combination of both. Muscle imbalances, joint dysfunction and neural stiffness can also lead to limited ROM.

Lack of flexibility can also lead to uncoordinated movement patterns and predispose a person to injury. It is important to differentiate between ROM limitations due to the musculotendinous unit or joint stiffness, and whether stretching or joint mobilization is required.

There are a variety of stretching techniques, from static to dynamic stretching, proprioceptive neuromuscular facilitation (PNF) stretching as well as myofascial release stretching, each chosen for a purpose and used to achieve a specific goal.

Restoring muscular endurance, strength and power

Following injury there will be a degree of lack in muscular strength, therefore this is an essential factor in rehabilitation to help a patient return to pre-injury status. Making use of different strength modalities (isometric, isotonic, and isokinetic) in all planes of movement will help improve strength as well as improving core and NMC.

To optimally improve muscular strength the use of eccentric, concentric, and isometric muscle contractions must be incorporated in the rehabilitative program, and this is achieved through a controlled tempo during exercise repetitions.

There are also other factors that can influence muscular strength such as the type of muscle fibers and how to develop them. It is also influenced through factors such as size, number of fibers, neuromuscular efficiency and age.

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