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The neuromuscolar coordination training program

Stefano Becchi, Paolo Adravanti - Parma

INTRODUCTION

When we talk about coordination exercises, we want to represent neuromuscolar training. The neuromuscolars components of balance begin with sensory input from specialized nerve endings called mechanoreceptors, wich are located in the joint capsules, ligaments, muscles, tendons and skin.
The mechanoreceptors pick up mechanical distortion of tissue and transmit that information through an afferent signal to the Central Nervous System. We call this process proprioception.
The CNS interprets the messages from the mechanorecptors, responding with an efferent signal of coded instructions to the muscles.
This complex series of messages and responses is known as neuromuscular coordination.

METHODS

The 3 components of the dynamic neuromuscolar coordination training protocol utilized in our Centre of rehabilitation include:

1) restoring muscle and joint performance through devolopement of strength, power, endurance acceleration/deceleration and restoring normal joint range of motion.
   We use isometric, isotonic and isocinetic devices in open and closed chains.
   We measure muscle performance with specific isokinetic tests.

2) restoring postural balance: the dynamic process of postural balance involves special sensory receptors that provide information in regards to various environmental and physiological conditions that may affect a person's ability to maintain equilibrium.
   They are as follows:
   - Vestibular apparatus
   - Visual imput
   - Proprioception input: the proprioceptive component of balance involves mechanoceptors located within the skin, muscle tendons and ligaments surrounding the joint.

   These structures play an important role in providing sensory information relating to touch, body position and rate of movement from external cues or conscius movement patterns associated with daily living.
   They also assist with providing adeguate response to perturbations or noxious stimuli via reflex loops within the spinal cord to protect the body from injury.
   The mechanoreceptors inform with afferent nerve fibers the Nervous System with continual impulses regarding the status of muscle at rest and during movement.

They are crucial in maintaining postural balance.
Balance is mediated by the same afferent mechanism that mediates joint proprioception, and is totally dependent upon the inherent ability to integrate joint posistion sense , kinesthesia and neuromuscolar control.
Balance training using an unstable balance platform simultaneously integrates all of the aforementionated sensorimeter components responsible for modulating muscle function at the lower extremity.
We encourage the training at the L.O.S. (limits of stability).
Limits of stability for standing balance is defined as the maximun angle a person's body can achieve from vertical without losing balance.
Maintaining L.O.S. is the result of integration of the sensory and motor control aspects of balance and plays an important role in activities of daily living.
Once the L.O.S. is exceeded, a corrective strategy must take palce in order to prevent a fall. L.O.S. for bilateral stance in normals adults is 8 degrees anterior, 4 degrees posterior and 8 degrees laterally in both directions.
A dinamic system allows for a more stimulating environment: with a dynamic multi-axial tilting platform, the line of action (centre of pressure) resulting from the vertical ground reaction force remains constant.
As the line of action moves away from the vertical ground reaction force, the force of gravity , acts on opposite sides of the subtalar axis of rotation.
Only a few degrees of joint motion are required to bring the joint and the resulting forces back into alignement.
For this reason, 20 degrees of support surface tilt is sufficient to stress the joint mechanoreceptors, while being limited enough to prevent excessive ankle displacement. A modern balance system has several clear advantages over low tech methods: biofeedback, objective documentation, reporting and comparaison to normative data. Any movement of the body's center of gravity away from a perfectly balanced position, results in the creation of a force moment that must be counteracted by an appropriate muscle activation pattern and generation of sufficient muscular torque to prevent the support surface from tilting.
These movements are governed by stimulation of the proprioceptive mechanorecptors.
Such mechanoreceptors are stimulated most by movement of the joint towards the limit of its range.
Thus, stimulation of mechanoreceptors to regain proprioceptive function is an important part of joint rehabilitation.

3) Gait analisys and gait rehabilitation: with special treadmill walking that offers repeated exercise of gait motion which increases strength, coordination and endurance.
Treadmill step training provides audio and visual biofeedback of actual vs. target step length
and step speed.

CONCLUSIONS

The training program utilized in our work is a synthesis of our experience .
The goal of the next training session is to continue to improve technique, while increasing duration, volume, and intensity of exercise.
In addition to technique perfection, the neuromuscular training was progressed to ensure a continued challenge to athletes and people in rehabilitation to maximize potential for successful outcomes.