

Masgutova Neurosensorimotor Reflex Integration® Used for Rehabilitation of Brain Stroke Patients

Ewa Kulig, PT, Dept. of Neurological Rehab., Assoc. of Pulmonological and Rheumatological Hospitals Opolskie, Poland, & Aleksandra Szalaj, PT, Dept. of Neurological Rehab., Assoc. of Pulmonological and Rheumatological Hospitals Opolskie, Poland, Opolskie, Poland, & NEUROREHA Opole, Center for Specialized Neurological Rehabilitation



Introduction

A new therapeutic method MNRI® (Masgutova Neurosensorimotor Reflex Integration) is being used to successfully treat patients with central nervous system dysfunction. This program, not commonly known yet, is beginning to generate a great deal of professional interest. MNRI® stands along side other known methods such as PNF, NDT Bobath, and the Vojta method. MNRI® is directed primarily at patients with psychomotor developmental problems as well as both neurophysiological and structural dysfunction related to central nervous system injury or dysfunction. This program is based on multi-year international clinical research and therapeutic application during rehabilitation camps. MNRI® promotes a holistic view of the patient, his development, experience as well as function. This program utilizes techniques designed to support nervous system function, activate and support mechanisms of neuroplasticity in the brain, as well as improving links and whole kinetic chains of movement, neuromuscular coordination, mechanism of self-regulation of muscle tone, and functioning of neural pathways. All of these improvements lead to improved structural and sensory-motor integration within the body.

The main goal of the MNRI® program is to help integrate reflex patterns and to help develop and to optimize gross and fine motor skills. Additionally, it facilitates cognitive and emotional development, especially in children, and improvement of function (in the case of adults) as they relate to the coordination of sensory systems and systems responsible for motor control with brain function.

The MNRI® program is designed to integrate primary, unconditional motor activity, namely, reflexes. Reflexes are the efferent reactions of the body in response to sensory or proprioceptive stimuli through participation and interpretation of the nervous system. Reflexes serve as the base for motor and cognitive development. A person is born with a set of reflexes that allow the body to adapt to the environment as well as facilitate cognitive development. Each reflex plays an important, underlying role by preparing the organism for the next stage of development. Reflex activation, development, and maturation leads to the integration of reflex patterns. Integration of the reflex, not their inhibition, are always correlated with the acquisition of new skills. Thanks to such integration, the lower levels of the central nervous systems (the brain stem, midbrain, and cerebellum) 'open up' a pathway to the cortex that simultaneously allows for the formation of new neuronal connections,



Ewa Kulig



Aleksandra Szalaj

development, learning, and cognition. Retained or inadequate primary reflexes can retard the development of both postural and dynamic responses that are necessary to allow the person to effectively interact with the environment. Such dysfunction may cause compensatory patterns and immature behaviors to be adopted that dominate even after new skills are acquired. As a result, instead of mature and well-integrated automatic function, constant conscious effort will be required since an organism responds to stimuli primarily through reflexes, but falling back to the most developed reactions in a particular situation that it is able to call forth.

The techniques provided within the MNRI® program may be used as part of a single therapeutic regimen or applied as individual techniques in support of other rehabilitative methods used with neurological patients. The choice of approach is based on the requirements of the patient's individualized therapeutic program.

MNRI® Therapy Types

Among the various techniques developed in MNRI®, two types are mentioned most often: Tactile Integration (S. Masgutova et al, 2005) and Neuro-Structural Reflex Integration (S. Masgutova, 2011) programs.

Tactile Integration Therapy This program is used for its valuable benefit in facilitating the functioning of a patient's sense of touch. The application of tactile therapy serves to stimulate and normalize the sensation of touch (both hypersensitivity and hyposensitivity), proprioception, and kinesthetic awareness as well to regulate muscle tone. These techniques stimulate the mechanisms of interaction between the different skin layers as well as its integration with fascia, muscles, tendons, and skeletal as well as nervous systems (S. Masgutova et al, 2005). It is important to note that touch is an important factor influencing a person's emotional state, feelings, mood and emotions. Tactile therapy is based primarily on specific massage techniques and the stimulation of the skin and touch receptors.

Neuro-Structural Reflex Integration Therapy This program is used to regulate the functioning of muscular as well as the proprioceptive and tendoneous systems as they closely correlate to protection mechanisms and protective reflexes. This therapy is directed towards the body's structure as well as symmetry mechanisms and the integration of reflex patterns. Each structural deficiency forces muscles and tendons to work harder and evokes negative protection reactions in the mind-body system. Neuro-Structural Reflex Integration therapy program influences the self-regulation mechanism of muscle tone as the reaction of tendons, fascia, muscles and their reaction to external stimuli. This therapy also influences the regulation of nerve impulse transmission. In this manner, the neurostructural integration program serves to normalize the individual links and chains in the kinematic movement system. It influences neuromuscular coordination and helps to restore structural integration based on the principle that structure regulates function. Neuromuscular techniques are used to provide powerful stimulation of the body's natural auto-correction mechanisms, while the reaction is directed into areas where improper tension, pain, or dysfunction presents itself (S. Masgutova, 2011).

As our experience also shows, this therapy also activates the lymphatic and vascular systems, regulating the hydrostatic pressure within the organism. As a result, the therapy serves to prevent swelling, helps to deliver nutrients to nerves and muscles, and activates gas exchange.

Neuro-Structural therapy is based primarily on specific manual techniques with which to work on soft tissues and the proprioceptive system as well as to stimulate neurosensorimotor points correlating to reflex patterns. This therapy has broad application not just with patients suffering from neurological issues, but also in orthopedic patients with skeletal dysfunction and pathology.

Application of MNRI® Therapies

Both tactile and neurostructural integration protocols can be applied independently and, based on diagnosis, as individual techniques in order to support the patient's individualized treatment plan. The main goal is to activate and optimize both physical and cognitive function in patients. This is meant to help the patient return to full and proper function and, in children, this often also means proper development.

Initial Patient Evaluation: Adult patient (male, age 65) seen after experiencing four ischemic strokes (over the course of 3 years):

- a stroke in the right hemisphere resulting in paresis of the left side of the body
- two strokes in the left hemisphere resulting in paresis of the right side of the body
- a stroke in brainstem resulting in quadriplegic paresis and increase in muscle tone.

Additionally, the patient has the following conditions:

- Type 2 diabetes
- vascular disease (atherosclerosis)
- high blood pressure.

Initially, the patient was treated at the Department of Neurology and subsequently admitted to the Department of Neurological Rehabilitation for a period of 4 weeks for further improvement.

After admission to the department of Neurological Rehabilitation, the patient's condition was described as:

- quadriplegic muscle paresis, more significant on the right
- general increase in muscle tone, more significant on the right
- disruption of balance, body righting reactions, and ambulation
- contracture of the Achilles tendon
- head positioned in slight reclination due to increased tone in the muscles of the head and neck
- dysfunctional Swallowing Reflex
- disruption of mechanisms of speech phonation and motor function
- positive Babinski response bilaterally
- dysfunctional Foot Tendon Guard Reflex
- hyperactive Foot Grasp Reflex
- dysfunctional Leg Cross Flexion-Extension Reflex
- hyperactive Robinson Hands Grasp Reflex presenting with overflow activation of flexion-adduction patterns of right upper extremity during ambulation
 - dysfunctional Hands Supporting Reflex
 - increased muscle tone and stiffness in the trunk
 - disrupted breathing rhythms with shallowness of breath (coughing reflex present with intermediate level of effectiveness)

The patient reported difficulty in transitioning from a seated position to standing (Berg Scale 1-2) – able to stand after 3-5 attempts. Initiation of movement was executed with a great deal of effort and with poor stability while standing. The patient was observed having great deal of difficulty in transferring their center of balance forward as well as over both lower extremities. A hyperactive Foot Tendon Guard response was observed, triggering strong dorsiflexion of the feet and increased tone of the quadriceps muscles. Increased tension of the trunk muscles with a hyperactive Trunk Extension response along with overflow activation of flexion-adduction pattern in the upper extremities was observed. These issues made it difficult to lean the trunk forward while performing the sit to stand transition. This transition was assigned a score of 1-2 on the Berg Balance Scale.

The patient's gait was slow, exhibiting a hip hiking and a circumduction pattern, was unstable and accompanied by great difficulty in shifting weight onto the right foot. Often, 2-3 attempts were required in order to complete the weight transfer. During the swing phase, the patient presented with right hip hiking, lack of right knee flexion correlated with considerable tension of the quadriceps muscle (this muscle tension visibly blocked movement), as well as plantarflexion of the sole of the foot. The heel strike phase triggered hyperactivity of the Babinski, Foot Grasp, and Foot Tendon Guard Reflexes which hindered appropriate weight bearing and loading response phase of the gait. Counter rotation of the trunk, due to disruption of neuro-muscular coordination, was also absent (disruption visible during activity and at rest). Additionally, the patient reported episodes of vertigo (loss of balance described as slight dizziness and "losing track" of the floor) resulting in falls. Within 10 days of admission, 5 such events were noted. The patient felt unstable, required physical assistance of an attendant and used an elbow crutch held in the left hand. Absent aid, the patient was transported in a wheelchair. The patient required assistance in performing daily tasks. The patient's function was assigned a score of 6 on the Hauser Ambulation Index (AI) scale (Note: 6 pts = "Requires bilateral support and more than 20 seconds to walk 25 feet; may use wheelchair on occasion").

Through palpation, increased muscle tone was observed in the following muscles:

- pectoralis major muscle
- trapezius muscle
- erector spinae muscle
- muscles of the head and neck: facial muscles, supra and infrahyoid muscles, temporal muscle and mas-

setter muscles

- quadriceps muscles: bilaterally, greater tone on the right side
- triceps surae muscles in the calves: bilaterally, greater tone on the right side

The muscles were rigid and stiff. The patient presented with limited range of motion of the knee joints. His range of motion was tested in the supine position to be:

- 45° active flexion of the right knee
- 90° active flexion of the left knee.

Rehabilitation: The patient underwent an individualized and complex physical rehabilitation program consisting of:

- Kinesiotherapy based mainly on Tactile, Neuro-Structural, and Dynamic and Postural Reflex Integration
- Neuro-speech therapy using MNRI® Program of Oral-Facial Reflex Integration
- Psychological therapy
- Group therapy

Physical rehabilitation sessions took place daily. The daily total was approximately 1.5 to 2 hours.

Techniques Used During Individualized Kinesiotherapy Sessions

The MNRI® method serves to facilitate integration of two types of reflexes:

- *Dynamic* – programming of automatic sequencing of involuntary movements and reflexes to stimuli
- *Postural* – reflexes in the context of reactions preparing the body to attain particular static postures reflexively.

The goal of the reflex pattern integration techniques is the creation of correct automatic motor responses to correct stimuli. Mature and automatic reflex patterns are essential for development of mature behaviors and help to assure safe and effective interaction of the organism with its environment. All corrective exercises are designed to create an appropriate reflex circuit in response to a specific stimulus (i.e.: a specific stimulus leads to a specific motor response). Three kinds of exercises maybe applied: passive correction, active-assistive, and isometric techniques.

During treatment sessions, exercises to integrate the following reflexes were used:

- Foot Tendon Guard
- Babinski
- Leg Cross Flexion-Extension
- Trunk Extension

Integration of the reflexes noted above positively affects control over posture, postural tone, neuromuscular coordination, coordination of movement, and muscle tone regulation. Ultimately, these exercises allowed for improvement and development of motor control and skills such as sitting, standing, and walking.

Focusing on the upper body, exercises to integrate the following reflexes were used:

- Grasp reflex
- Babkin Palmomental
- Hands Supporting
- Hands Pulling

Integration of the above reflexes positively affects neuromuscular coordination of consciously controlled movements, muscle tone regulation, and functioning of the upper extremities as well as the activation of mechanisms maintaining symmetry within the mind-body system. These exercises ultimately allowed for improvement in head righting and swallowing, chewing as well as phonation and motor control of speech.

Results Achieved Through MNRI® Tactile Therapy:

- improvement in perception of light touch (touching and stroking of the skin)
- stimulation of perception of deep touch (squeezing and stretching)
- kinesthetic stimulation of movement and balance (joint and trunk rotation)

Results Achieved Through MNRI® Neuro-Structural Reflex Integration Therapy:

- relaxation of hyperactive Core Tendon Guard response
- regulation of muscle tone and tension of tendons in the entire body
- activation of proprioception and the connections between various body systems in order to enable the

optimal functioning self-regulation mechanisms

- activation of receptors of deep touch and pressure
- stimulation of structural body symmetry
- stimulation of symmetrical efferent responses of the central nervous system to stimuli
- activation of movement in the horizontal plane, or in other words, the dynamics involved in moving the upper and lower parts of the body
 - improvement in the coordination between alternating (reciprocal), homologous, and homolateral movement of the limbs
 - stimulation of nerve transmission
 - improved blood circulation
 - improvement in the flow of lymph within the lymphatic system
 - stimulation of the breathing reflex and improved breathing function
 - improved gas exchange in breathing
 - improved swallowing, phonation, and speech

Final Patient Evaluation

The following results were obtained after applying the therapeutic regimen:

- general improvement in neuromuscular coordination and control over muscle tone
- reduction of the generally elevated muscle tone on both the right and left sides of the body
- clear improvement in balance and righting reactions
- significant improvement in locomotive function (walking, standing up, sitting, etc)
- reduced trunk stiffness and improved regulation of muscle tone
- reduced shortening of the Achilles tendon
- improved functioning of improperly integrated reflexes:
 - o Trunk Extension Reflex
 - o Foot Tendon Guard Reflex in both lower extremities
 - o Babinski Reflex in both lower extremities
 - o Leg Cross Flexion-Extension in the lower extremities
 - o Foot Grasp Reflex
 - o Robinson Hands Grasp Reflex
 - o Hand Supporting Reflex
- reduction of elevated muscle tone in the head and neck
- improved swallowing and breathing function
- improved phonation and motor control of speech

After the applied therapy, the patient generally felt distinct functional improvement in activities of daily living (ADL), ambulation, locomotion, and communication. The patient became more independent, improved mood and wellbeing, became more active and more eager to verbally communicate.

The patient's gait became more stable and reciprocal but with some trace of hip hiking and circumduction during the swing phase. He attained a more appropriate gait pattern with better bilateral flexion in the knee joints as well as contra-rotational movement of the trunk. Patient still presented partial weight bearing on the right lower extremity. However, multiple attempts were no longer required. Each of the following reflex patterns was improved: Foot Tendon Guard, Babinski, Foot Grasp, and significant improvement in Leg Cross Flexion-Extension. These improvements allowed for better muscle tone regulation and improved coordination of the gait pattern (initial contact of the heel, loading response, stance phase, and swing phase). The patient began ambulating without assistance while using a single elbow crutch. He improved, reaching a score of 4-5 points on the AI scale. After 10 days of therapy no incidence of loss of balance or falls were recorded.

Statistically significant improvement was seen in both trunk muscle tone regulation and control as well as Trunk Extension and Foot Tendon Guard Reflex patterns. This enabled improved dorsal flexion and better extension of the lower extremities and easier sit-to-stand transitions with fairly good forward shifting of the center of gravity. However, there is still visible asymmetry in weight bearing between the lower extremities. Each time, the patient was able to stand successfully on the first attempt. The patient felt more confident and stable, with less swaying and loss of balance, attaining 3 points on the Berg balance scale. In the stand-to-sit

transition, the patient received 4 points on the same scale.

While palpating individual muscles it was clear that there was a reduction in elevated muscle tone. The muscles became more flexible, pliable, and available for contraction. Through normalized muscle tone of the quadriceps muscle in both lower extremities, active flexion of the right knee was improved to 70°.

The muscle tone in the face and neck became more normalized. As a result, improvement was seen in head righting, swallowing, as well as phonation and motor control of speech. Reduction of hypertonicity of the trunk muscles and improved control over their contraction allowed for improvements in breathing including the lengthening of inhalation and exhalation.

Improvement in the functioning of the Hands Supporting, Hand Grasp, and Babkin Palmomentary Reflexes was observed. Due to these reflex improvements, as well as muscle relaxation, normalization of muscle tone, and coordination of movement, hand function was also improved.

Summary

Modern medicine and rehabilitation serves the twin goals of treating patients suffering from central nervous system dysfunction and to improve their quality of life. With the application of a tailored rehabilitation program, cooperation between the therapeutic team and the patient's family, and the use of modern methods such as the MNRI® program, the patient stands a much greater chance of improving various functions. These include improvement in both physical and mental functions, improved sense of confidence, independence, and self worth. This, in turn, translates into a sense of dignity and improved quality of life.

This study has demonstrated both the efficacy in the therapeutic benefit of MNRI® therapy.

MNRI® can be used effectively in the therapy of stroke patients. The nature of interdisciplinary approach used in MNRI® for patient with neurodeficits demonstrated progressive results. The work with other stroke patients repeated by the author has also proved effective of the MNRI® for neuro-rehabilitation of stroke patients.



We wish all our post-stroke Winners good health and great success in their rehabilitation and life.
– Eva Kulig & Aleksandra Szalaj