The MNRI® program and its techniques are designed to restore neurosensorimotor development; to integrate primary movements, reflexes, coordination systems, and skills and to enable optimal functioning, development, and learning. This program uses a problem solving approach for neurodeficits through strengthening or rerouting the physiological circuits of poorly developed reflexes. It also enhances reflex pattern functioning while maximizing the motor-cognitive abilities in highly functioning individuals. The MNRI® program is aimed at activation of genetic motor memory and, using this type of memory, it optimizes and restores a normal route for the flow of information from the environment and its processing by the child/adult’s nerve system. It simultaneously addresses the processes that release negative effects of stress and over or under-protection as these reflexes are also units of our defense mechanisms, used for protection and survival.

**MNRI® Assessment of Reflex Development**

With a clear understanding of reflex development and its place in an overall conceptualization of the chronology of an infant’s motor system, one can identify normal or abnormal reflex motor pattern expression during infancy. However, maturation and integration of reflex patterns differ among infants at different ages as they progress through interrelated phases such as:

- reflex circuit establishment (linking all its components – ascending sensory and descending motor) during the newborn period of development
- basic pattern or unconditioned reflex development (proper functioning of their automaticity) and neurological maturation
- transition of a reflex from an unconditioned to a conditioned level (incorporating experience and learning)
- maturation of a conditioned reflex pattern (some reflexes, like eye tracking for reading, need to be cortically controlled and free from being overridden by an automatic reflex like head righting).

Early assessment and correction of abnormal reflex patterns are necessary to ensure needed support for adequate future neurodevelopment. For example, the Bauer Crawling Reflex emerges at 12 weeks of gestation and should be integrated at the end of four months, postnatally. Although children do not demonstrate active crawling at four months, the reflex, as unconditioned, must be integrated then in order for it to serve as a resource at six months to begin intentional crawling—to move the limbs and whole body in a reciprocal way.
for physical development and towards interesting objects. This intentional movement will soon evolve into successful crawling on all fours after 7–10 months. Crawling influences the motor development that is required for conscious reaching and other movements, the infant’s orientation in space and time, multitasking, and cognitive development (G. Doman, 1984; C. Delacato, 1954; P. Dennison, 1986; B. Nikitin, L. Nikitina, 2004; S. K. Masgutova, 2004, 2008, 2011). A delay in the initiation of early unconditioned crawling negatively affects all other phases of the Crawling Reflex. Thus, an assessment of the Bauer Crawling Reflex, followed by noninvasive training in support of the natural sequence of this reflex development, is a key element in a child’s neurosensorimotor development. So, matured reflexes are an essential part of a child and adult’s development. And they are displayed in specific ways at different ages – not obviously seen in our movements and behavior directly, nevertheless, they are a unit of our nerve system.

The role of an evaluation of reflex patterns is important in cases of individuals with neurodeficits. These neurodeficits result in poor functioning circuits (the improper functioning of receptors and nerve pathways), poor electrical conductivity of nerve impulses, deficits of biochemical mediators (neurotransmitters in sensory and/or motor nerves), and an inability to regulate muscle tone and create a motor or postural response.

**Reflex Assessment Parameters**

For diagnostic purposes, some investigators have classified reflex response expression as follows: normal, hypo-reflexive, hyper-reflexive, or a-reflexive (J. Barashnev, 2001; H. Cohen, 1999; D.E. Heines, 2002; L. Sadowska, 2001; I. Krasikova, 2001; D. Muller, 1966; R. S. Illingworth, 1978; I. Nelson, 1979; N. Akhmatova, S. Masgutova, 2008). Masgutova has also created a reflex dysfunction-maturation-integration scale to assess their relative level of maturity and integration (S. Masgutova, 2011).

The MNRI® program uses the Assessment protocol to evaluate the level of reflex development/integration. The Assessment identifies the effects of poor reflex integration and then serves as a baseline for a program designed to improve reflex circuit functioning. An MNRI® practitioner will administer specific stimuli in multiple tests for each reflex and then determine whether or not it is:

- present to an age-appropriate degree
- appropriately developed and functional
- integrated with sensorimotor functions and skills used in movement, physical development, and learning.

A basic reflex pattern consists of the coordinated performance of sensory-motor systems in a three-part circuit (sensory input, its processing, and motor outcome, see Figure 1). Because measuring sensory sensitivity and brain processing is not currently easily available, the Assessment procedure evaluates whether the motor response is proper or not. The basic reflex pattern is evaluated in each of five parameters: integrity of the sensory-motor circuit, sequence and direction of the motor response, latency (timing and speed), intensity (muscle tone regulation), and symmetry.

- **Sensory-motor pattern of a reflex (or a circuit):** The reflex consists of coordinated sensorimotor links within the reflex circuit (receptors, sensory neurons, synapses, and motor neurons) which...
are determined genetically. The motor response should be accurate or correct to the inherent encoded response pattern associated with the specific sensory stimulus (H. Cohen, 1999; D.E. Heines, 2002).

- **Direction of the response in a reflex:** Each reflex consists of a specific sequence of motor responses that culminate in a posture or are continued as movement in a specific direction. The muscle system coordinates these postures and movements. The direction depends on the coherent performance of alpha and gamma motor neurons.

- **Latency (timing and speed of response):** The reflex circuit (involving sensory input, brain processing, and motor response) must provide the proper speed for the nerve impulse, along the neuron axons, to achieve a motor response which should begin in a fraction of a second (107 bit/seconds) from the moment of sensory stimulation and must continue for an adequate length of time until a stimulus is presented (H. Cohen, 1999; D.E. Heines, 2002). It must also complete its response/pattern quickly enough to fulfill its information and protective function. A delayed or slow reflex response could result in injury.

- **Intensity (strength) of a reflex response:** The intensity of a reflex is the amount of physical strength supplied by a certain system of muscles, tendons, and ligaments in response to a stimulus received by the reflex pattern. The strength of that response should reflect the intensity of the stimulus (excitation). Hyperactive, hypo-active, and a-reflexive responses are inadequate; only normal responses stand for a matured reflex pattern capable of serving as the basis for neurodevelopment and protection.

- **Symmetry:** Symmetry/asymmetry in a response can be seen in the bi-lateral response on a level of sensory-motor pattern, direction of the response, latency/timing, and also intensity of the reaction.

Evaluating reflex pattern integration requires an in-depth knowledge of neurosensorimotor reflex development gained via specialized education and extensive clinical experience. Based on the Assessment, an individualized program is designed for the correction of dysfunctional reflex patterns and to enhance motor-cognitive development. The main goal of the individualized program is to strengthen and support physical, emotional, and cognitive growth in the individual. MNRI® practitioners demonstrate through their work that it is possible to change dysfunctional or pathological reflex patterns into higher levels of functioning that support learning. The Assessment findings are used to help children and adults gain access to the genetically given resources that support motor-cognitive functioning and maximize their developmental potential.

Because each one has its own developmental dynamic and purpose, reflex patterns often reveal the reasons for functional delays. MNRI® Assessment practices show that delayed maturation or integration of a reflex can greatly disrupt the next level of motor development and cognitive functioning. Below are examples of reflexes and the skills that may be compromised if they fail to integrate:

- **Core Tendon Guard and Tonic Labyrinthine – postural control, protection mechanisms, which also influences visual-auditory processing, regulation of the HPA-stress axis (hypothalamus-pituitary gland-adrenal glands)**
• Asymmetrical Tonic Neck – formation of antigravity and, within that, the exploration of acceleration and inhibition mechanisms used while our bodies move (for example, head turning to the side) which also influences monaural and binaural hearing, language and auditory processing, auditory memory, and spatial orientation
• Symmetrical Tonic Neck and Truck Extension – postural control of the head and trunk which also influences eye tracking, visual convergence-divergence, binocular vision and binaural hearing, attention span ability, reading, and writing
• Spinal Galant – spine motion control, spinal column development which also influences cross-lateral coordination, focusing, awareness, hyperactivity, and auditory processing
• Spinal Perez – spine motion control and spine lordosis-kyphosis regulation which also influences reaching and brain detoxification
• Visual Reflexes – Horizontal, Vertical Eye Tracking which also influences Convergence-Divergence, Ocular-Vestibular, Optokinetic, Visual Fear Paralysis (eyes freezing/dilating), visual recognition, comparison, analyses and prioritizing, reading (fast and with comprehension), and writing
• Robinson Hands Grasp, Babkin Palmomental, and Hands Pulling – influences hand-eye coordination, manual skills, including writing and drawing, and expressive language
• Sequential Fingers Opening and Closing – supination, pronation movements of the wrist which also influences spatial orientation for hands, differentiation, calculation, and other mathematical skills.

### Application of the MNRI® Assessment (Examples)

**Assessment Procedure (Parameters and Features)** Every reflex pattern is evaluated according to five main parameters and four features in each parameter (20 points are possible). At left is an example of parameters and features of Hands Pulling for a sample evaluation. The functioning of the features (proper or not proper) shows the level of the development of the reflex pattern and also allows the therapist to create a recommended program for an individual, in case correction is needed.

**Interpreting the MRI® Reflex Parameters**

In the MNRI® Reflex Parameters quantitative analysis evaluates the expression of basic reflex patterns in terms of their functionality. A functional reflex generates an automatic protective response when needed and also serves as a foundation for further neurosensorimotor development. The scoring for each reflex is based on evaluation of the five parameters described above: pattern, direction, latency (timing/speed), intensity, and symmetry. Each parameter can earn a score from 0 to 4 as a result of appropriate functioning of four features (e.g., the features of a

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### Table 1. Hands Pulling – Parameters and Features

#### 1. Reflex Circuit (sensory-motor aspect):

| #  | Features                                                                 | Functions     | Not clear
|----|--------------------------------------------------------------------------|---------------|-------------
| 1.1| Motor response is in norm and corresponds to a sensory-proprioceptive stimulus (and age) |
| 1.2| Stimulus triggers the flexion of elbows in priority (and is coordinated with visual convergence) |
| 1.3| Proper sequence of flexion of elbows, next head and then the core |
| 1.4| Ability to extend the spine when reaching a sitting up position (and is coordinated with visual divergence) |

#### 2. Direction of the response in a reflex pattern:

| #  | Features                                                                 | Functions     | Not clear
|----|--------------------------------------------------------------------------|---------------|-------------
| 2.1| Direction of response is flexion and in norm and corresponds to a stimulus (and age) |
| 2.2| Flexion of the elbows causes sequence of flexion of the head and core (and is coordinated with visual convergence) |
| 2.3| Abduction/adduction of arms functions properly |
| 2.4| Ability to extend the spine when reaching a sitting up position (and is coordinated with visual divergence) |

#### 3. Intensity of the response (muscle tone regulation):

| #  | Features                                                                 | Functions     | Not clear
|----|--------------------------------------------------------------------------|---------------|-------------
| 3.1| Strength of response is normal and corresponds to a stimulus and age |
| 3.2| Flexion of the elbows causes sequence of flexion of the head, first, and then, the core |
| 3.3| Contraction of leading muscles show appropriate motor activity |
| 3.4| Ability to keep strength of muscles proper during every step of sequence of flexion of elbows, head and core with ability to extend the spine when reaching a sitting up position |
Reflexes of the Brain

Reflex circuit in Hands Pulling are: 1) adequacy of motor response to a sensory-proprioceptive stimuli; 2) stimuli triggers the flexion of the elbow in priority (and is coordinated with visual convergence); 3) proper sequence of flexion of: elbows, next head, and then the core; 4) ability to extend the spine when reaching a sitting up position (and is coordinated with visual divergence; see Table 2). The combined number of points earned for each feature (1±1±1±1) parameter becomes the measure of functionality for that particular reflex. Each reflex earns a total score between 0 and 20 (5 parameters and 4 features in each), placing it on a continuum between severe pathology and a high level of integration.

**Criteria for individual features of basic reflex pattern evaluation scores (see Table 2 below):**

4 = Appropriate – all four features are correct
3 = Three features are correct, one is incorrect
2 = Two features are correct, two are incorrect
1 = Dysfunctional – one feature is correct, three are incorrect
0 = Pathological – all four features are incorrect

An Assessment of reflex patterns before and after an MNRI® Exercises Program completed or re-administered (usually every 6 months) allows us to see the progress in the reflex pattern development. An example Assessment of the main parameters of a basic reflex pattern development/functioning allows us to determine the levels of pathology, dysfunction, development, and integration.

The MNRI® Assessment program can evaluate up to 30 or more reflexes of gross-motor/core and limb coordination which can be carried out altogether or chosen according to specific research or therapy program goals. This Assessment is approached in three related groups according to 1) the sagittal, 2) horizontal, and 3) dorsal planes of the body and movements.
Statistic analysis allows us to calculate the number of reflex patterns that are dysfunctional/pathological or in the norm; and, in the case of 35% or more of dysfunctional reflexes, to presuppose that developmental specialists can deal with the phenomenon of ‘Reflex Integration Disorder’ (RID; S. Masgutova, 2011). Analysis of reflex profiles of children from different groups with challenges shows that RID is typical for children with autism (3,700 assessed individuals) as 86.7% of their reflex patterns are dysfunctional. Assessments of children (2,560 individuals) with post-traumatic stress show that 46.6% of their reflex patterns are dysfunctional. Knowledge of the state of a person’s reflex functioning can be key in choosing a professional facilitation strategy.

Reflexes and their dynamics are also interpreted in Assessment reports within 9 clusters according their effect on different sensory systems, behavioral and emotional patterns, their protective role, and affect on cognitive functions. Summarizing the results within clusters can help to identify some general tendencies of reflex patterns that impact different aspects of an individual’s functioning (Also

<table>
<thead>
<tr>
<th>Points</th>
<th>Definition</th>
<th>Level of dysfunction/pathology</th>
<th>Points</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.00-11.75</td>
<td>On the boundary between normal function and dysfunction. Elements of correct pattern.</td>
<td>6.00-7.75</td>
<td>Incorrect, dysfunctional.</td>
<td></td>
</tr>
<tr>
<td>12.00-13.75</td>
<td>Basic reflex pattern is functional at a very low level of development.</td>
<td>4.00-5.75</td>
<td>Incorrect, Deep dysfunction.</td>
<td></td>
</tr>
<tr>
<td>14.00-15.75</td>
<td>Functional, but at a low level of development.</td>
<td>2.00-3.75</td>
<td>Incorrect pattern. Pathology.</td>
<td></td>
</tr>
<tr>
<td>16.00-17.75</td>
<td>Average development. Basic pattern support the development of variant patterns.</td>
<td>0.00-1.75</td>
<td>Incorrect pattern. Severe pathology.</td>
<td></td>
</tr>
<tr>
<td>18.00-19.75</td>
<td>Matured level of a basic reflex. Functions on a higher level than average.</td>
<td>8.00-9.75</td>
<td>Incorrect pattern with some correct features. Mild dysfunction.</td>
<td></td>
</tr>
<tr>
<td>20.00 and over</td>
<td>High level of integration of basic reflex pattern and its variants.</td>
<td>6.00-7.50</td>
<td>Incorrect pattern.</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Criteria of development/functioning of a reflex pattern
Table 4. Clusters of Reflex Patterns Serving Specific Areas of an Individual Functioning

<table>
<thead>
<tr>
<th>Clusters</th>
<th>Functional Area</th>
<th>Reflex Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1</td>
<td>Upper Limb Reflex Patterns</td>
<td>Hands Grasp, Hands Pulling, Babkin Palmomental, Hands Supporting, Upper Core Tendon Guard</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>Tonic Reflex Patterns</td>
<td>Core Tendon Guard, TLR, ATNR, STNR, Abdominal, Spinal Galant, Spinal Perez</td>
</tr>
<tr>
<td>Cluster 4</td>
<td>Lower Limb Reflex Patterns</td>
<td>Babinski, Foot Grasp, Foot Tendon Guard, Leg Cross Flexion-Extension, Thomas Automatic Gait, Bauer Crawling, Trunk Extension, Core Tendon Guard, Grounding, Flying &amp; Landing</td>
</tr>
<tr>
<td>Cluster 5</td>
<td>Gross Motor Reflex Patterns</td>
<td>Core Tendon Guard, STNR, Trunk Extension, Thomas Automatic Gait, Moro Embrace, Fear Paralysis, Spinal Galant, Spinal Perez, ATNR, Sequential Rolling, Spinning, Locomotion, Flying &amp; Landing, Landau, Grounding, Hands Pulling, Hands Supporting</td>
</tr>
<tr>
<td>Cluster 7</td>
<td>Protection and Survival Reflex Patterns</td>
<td>Core Tendon Guard, Fear Paralysis, Moro Embrace, Hands Supporting, Hands Grasp, Bonding</td>
</tr>
<tr>
<td>Cluster 8</td>
<td>Curiosity/Cognition Supporting Reflex Patterns</td>
<td>Pavlov Orientation, Core Tendon Guard, ATNR, STNR, Babkin Palmomental, Hands Grasp, Hands Pulling, Bauer Crawling, Leg Cross Flexion-Extension, Landau, Flying &amp; Landing, Segmental Rolling, Spinning, Bonding</td>
</tr>
<tr>
<td>Cluster 9</td>
<td>Reflex Patterns Supporting Emotional Stability, Maturation</td>
<td>Bonding, Fear Paralysis, Moro Embrace, Core Tendon Guard, Pavlov Orientation, Babkin Palmomental, Hands Grasp, Hands Supporting, Landau, Flying &amp; Landing, Segmental Rolling, Spinning</td>
</tr>
</tbody>
</table>

Table 5. Cluster 1. Upper Limb reflex patterns (example of the Pre-assessment of S.D., a 5-year old child with CP, hypotonia).

Figure 7 of this Assessment report shows the dynamics of changes in a cluster of reflex patterns after the MNRI® program compared to its pre-assessment. In this example, the progressive dynamic in development of each parameter is seen. Significant changes in parameters, such as the circuit, direction, and symmetry allow us to conclude that the program was effective as these reflex parameters are especially difficult to change. This also allows us to create the best individualized strategy for positive growth for a person in their future MNRI® therapy sessions.
The MNRI® program is created for the facilitation of the growth potential in children and adults with challenges such as cerebral palsy, Autistic Spectrum, attention deficits – ADD and ADHD, dyslexia and hyperlexia, genetic syndromes, developmental delays, fetal alcohol syndrome, PTSD, and many other challenges. An Assessment also can be used as a tool to define the progress or results of therapy sessions by MNRI® or any other method used by an individual.

The MNRI® Assessment allows for qualitative and quantitative analysis. The quantative analysis is oriented on measuring the specific parameters, such as reflex circuit, direction and sequence of movements in response, intensity, timing and symmetry, which altogether allows creating a specific and individual oriented therapy program. An Assessment is suggested every 6 months for individuals going through the therapy process to evaluate changes and to change the therapeutic program or strategy, if needed. The results of MNRI® for individuals with challenges strongly show the importance of appropriate corrective procedures for dysfunctions on the level of primary movements and reflexes. They have clearly demonstrated that reflexes are the units of the sensory, motor, and proprioceptive systems influencing health, learning, and development. The MNRI® program demonstrates new opportunities arising from the use of natural resources, which awaken the self-regulating process through reflex integration. It is offered as potentially a strong support for the creation of new developmental possibilities and programs for children and adults. The reflex integration methods involve natural, non-invasive movements that can be easily learned by parents of challenged children or adults and by professionals who work with challenged individuals. These techniques also do not require a lot of external resources.

Evaluation of the reflex pattern is not intended to be the basis for labeling any child or adult because of neurological symptoms, physical or mental disability, age, and other factors. It serves exclusively to identify goals for future support of the person’s natural, genetic motor programs and as the basis for further development of motor-cognitive functioning.

With the MNRI® concept, it is possible to change dysfunctional or pathological reflex patterns to function better for development and learning. The information on reflex pattern evaluations gives insight to the highest potential of the person’s development for the realization of their natural innate resources and possibilities.
References


