



## Post-Trauma Recovery in Children of Newtown, CT using MNRI Reflex Integration

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### Abstract

Trauma recovery is an extremely urgent concern in today's world as highly stressful events appear to be on the rise and corresponding professional support for individuals experiencing traumatic stress, especially children, is lacking.

The experience of survival of traumatic events – natural disasters or human made catastrophes, physical, emotional and sexual abuse, and violence, witnessing a mass shooting, terrorism and wars can be anchored to memories, causing negative protection, fear, and worry. The efficacy and validity of various therapy modalities has been established in other contexts: psychotherapy, psychiatry, pharmacology, and alternative interventions. However, these current primary treatments are not adequate for many, especially children. They do not address the neurosensorimotor integration needs of those with post-traumatic stress and PTSD, and they may not orient a client toward new perspectives and well-being. These methods are sometimes seen by parents of child trauma survivors as a metaphysical imitation of treatments designed for adults and not reflective of the specific recovery needs of children.

The MNRI® Program proposes a unique therapy modality based on work with neurosensorimotor integration mechanisms, using reflex patterns as 'ready-made' neural schemes that aid in survival and the development of the nervous system. These reflex integration techniques provide support for the extrapyramidal and subcortical brain structures that become dominant in stress, resulting in over-reactivity (excess activation of freezing and/or flight-or-flight mechanisms) and limited ability to make rational decisions.

Detailed MNRI® assessment data on the reflex function of children who experienced the Sandy Hook School tragedy in Newtown, CT in 2012 (n=134; Study Group 1) were analyzed and compared with assessment data on child survivors of other catastrophes (n=340; Control Group 1) and typically developing children with no history of traumatic stress (n=730; Control Group 2).

This comparative analysis demonstrated positive changes in reflex pattern function for the Newtown children who received the MNRI® Trauma Recovery protocol, and responses to detailed questionnaires on stress resilience and the dynamics of change in their abilities also demonstrated improvement in overall stress level, emotional and behavioral regulation, and cognitive function.

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### Keywords

Trauma recovery; MNRI Newtown; Survival; Protective reflex patterns; Core tendon guard; Moro; Fear paralysis

### Introduction

Trauma recovery is an increasingly urgent concern in a world where it is getting easier and easier to inflict mass suffering and which lacks corresponding professional support for individuals who experience traumatic stress, especially children. A national statistical study of 3.4 million referrals to child protective services, representing 6.2 million children, revealed that these children were suffering from the following traumatic stresses: neglect 78.5%; physical abuse 17.6%; and sexual abuse 9.1%. A study of 4549 children aged 0-17.2 indicated that 60.6% had experienced or witnessed victimization [1].

Survival of natural disasters or human-made catastrophes, physical, emotional, and/or sexual abuse, bullying at schools and colleges, experiencing or witnessing violence such as a mass shooting, terrorism, or war can be imprinted in individuals' memories as terrifying images that can last their entire lives and anchor negative protection responses in their brains and amygdalae, specifically, the area responsible for fear and worry. With trauma and its dire fallout so prevalent, discussion of the efficacy and validity of different treatment modalities becomes very important, especially with respect to early childhood. The best-known primary treatments for traumatic stress and PTSD today include psychotherapy for emotional adjustment, medication for symptom relief [2], and alternative interventions such as Peter Levine's Somatic Experiencing [3], Francine Shapiro's Eye Movement Desensitization and Reprocessing (EMDR) [4] and various forms of energy work. The main treatments for children include Cognitive-Behavioral Therapy - CBT [5] and Trauma-Focused CBT -TF-CBT, which involve direct discussion of the traumatic event (exposure); anxiety management techniques such as relaxation and assertiveness training; and correction of inaccurate or distorted trauma-related thoughts [6].

The long-term experience of the author and our team of MNRI Specialists who work with disaster and catastrophe survivors all over the world, helping them with their traumatic stress release and recovery processes, however, has brought them to the conclusion that current primary treatments are not adequate and do not address the unconscious, neurosensorimotor integration needs of those with traumatic stress and PTSD [7]. While it can be helpful to address cognitive and emotional functioning with psychotherapy, and to use pharmaceutical support aimed at the somatic consequences of traumatic shock and the release of tension and pain in the muscular-tendon system, these interventions often do not lead to complete recovery. They also do not guarantee transition one from a state of negative protection to a positive state or a change in perspective, with a new sense of life and well-being. At times, these methods are evaluated by parents of child trauma victims as metaphysically imitating treatments for adults and not reflective of the specific recovery needs of children.

The MNRI Program proposes a unique modality based on work with neurosensorimotor integration mechanisms through reflex patterns as 'ready-made' neural networks that aid in survival and provide a foundation for further nervous system development. This treatment is particularly beneficial for children in trauma (though it works well for adults as well) as, unlike 'talk therapy' which requires cortical involvement, it directly addresses the extrapyramidal and subcortical brain structures that become dominant in stress, with their consequences of over-reactivity and limitation of rational decisions.

Trauma symptoms originate in automatic freeze and fight or flight responses [8-14]. Work with individuals experiencing traumatic stress using the reflex integration concept and tools indicates that the trauma can only be fully released by working with these non-rational automatic responses that originate in the nerve networks of reflex systems. These reflex systems enable survival through the extrapyramidal nerve system, brainstem functions (including peripheral nerve system, spinal cord), the interbrain (basal ganglia, thalamus, amygdala, insula, and limbic system), and the cortex [10-12,15-22]. Traumatic or unbearable stress is known to damage the neurons of reflex circuits. Several PTSD studies indicate that 5-10% of the neurons of the extrapyramidal system are damaged in individuals who have experienced trauma [13,23], leading to possible reflex integration disorder [7]. This data shows that traumatic stress can damage reflex functions and even the circuits themselves. Reflexes are automatic and reactive responses that govern our actions, behavior, emotions, and thoughts in traumatic stress; thus, it is crucial for practitioners to understand that the reflex integration concept is a key for transition from the shock state, with its negative anchors of trauma, to a state of positive protection that supports not only survival, but the ability to thrive as well, enabling further development of self-regulation mechanisms and neural networks.

This paper reports the results of assessment and initial MNRI therapy work done on a voluntary basis with 134 children directly or indirectly involved in the tragic Sandy Hook School shooting in Newtown, CT on December 14, 2012. Our voluntary work is continuing.

These results are based on over 25 years of successful clinical experience using the MNRI Reflex Integration therapy protocol with trauma survivors, particularly on the work of Dr. S. Masgutova and her team with patients evacuated from traumatic events such as the Chernobyl nuclear disaster (1986-1996); the Baku conflict (1990-1991); the earthquake in Armenia; the train crash in Ufa (1989); the Chechen War (1996-1999); conflicts in Israel (2001-2005); suicidal individuals, and survivors of large accidents, explosions, and abuse [7,24-26].

Detailed MNRI assessment data on the reflex function of children who experienced the tragedy of the Sandy Hook School shooting in Newtown (n=134; Study Group 1) were compared with data on child survivors of other catastrophes (Control Group 1) and typically developing children with no experience of traumatic stress (Control Group 2). This comparative analysis of reflex pattern function and development data in these children before and after use of the MNRI Trauma Recovery protocol demonstrates significant positive changes occurred in their reflex pattern function. Responses to a detailed questionnaire on dynamic abilities also demonstrated positive changes in the level of stress resilience, emotional and behavioral regulation, and cognitive function.

## Concept Background: Reflex Function in Trauma

### The MNRI model

In a stress or 'Alarm State' (Cannon, 1931) the sympathetic nervous system triggers adrenaline release in the HPA-stress-axis (hypothalamus-pituitary-adrenals), resulting in typical stress symptoms: shallow breathing, rapid heartbeat, trembling, etc. Energy goes to the limbs to enable escape or self-defense (fight or flight). A relaxation response is reached by the parasympathetic nervous system when danger has passed and it is safe to return to the 'Non-Alarm State.'

In the wake of an intense stress, more significant symptoms may appear and persist with intense memories, tremors, poor balance, unstable gait, and muscle tension among them. A healthy individual will gradually shift into a parasympathetic-mediated state within a few days or weeks.

When the sympathetic nervous system becomes dominant, and the parasympathetic does not restore the Non-Alarm State frequently enough, neurophysiological damage can ensue, reducing one's ability to maintain emotional and behavioral stability [11,12], leading to a dysfunctional motor response, rendering it hypo- or hyperactive or even pathological, causing anxiety, panic, poor sleeping patterns, relationship difficulties, and more. Unbearable flashbacks, hypervigilance, and emotional numbness are usually present in PTSD. PTSD can exist comorbidly with other disorders, e.g. anxiety disorder, depression, and/or addictions [11,12,27].

The normal stress response can also be described through neurosensorimotor reflex circuits and their genetically programmed survival functions. Reflexes, the automatic, unconscious responses of the nervous system to specific sensory stimuli, are the keys to our survival, our genetic and epigenetic birthright, and ensuring nervous system stability in stress [28].

Reflexes are essential for future motor, sensory, emotional, and cognitive development [13,29]. MNRI, however, focuses primarily on protective reflex functions to improve stress resilience and neural connectivity. The Tendon Guard, Moro, and Fear Paralysis reflexes, in particular, are genetically designed to handle stress, and they are the most vulnerable to damage when stress gets too intense; thus, they are the most likely to be dysfunctional in traumatic stress and PTSD.

**The Core Tendon Guard Reflex (CTGR)** is a generalized body protective response to stress (Figure 1).

**Defensive function:** The CTGR sends sensory information to the brain, where the reticular activating system (RAS) and thalamus decide whether stress is a threat. If so, the entire organism is activated through the HPA-stress-axis (hypothalamus <—> pituitary gland <—> adrenals) causing freeze or fight-or-flight responses. Adrenaline, cortisol, and noradrenaline are produced and regulated by the HPA-stress-axis, and the CTGR regulates the excitation of the HPA-stress-axis through the Tonic Labyrinthine Reflex (flexion-extension responses to gravity) and the Golgi system. When the CTGR is insufficient to cope with an intense stress, Fear Paralysis, Moro and/or other reflexes may be activated as well to provide increased emergency protection.

The freeze response is characterized by flexion, including core withdrawal, breath holding, visual convergence, and lack of movement. The fight-or-flight response is the opposite and is characterized by extension: visual divergence, backward trunk extension, and

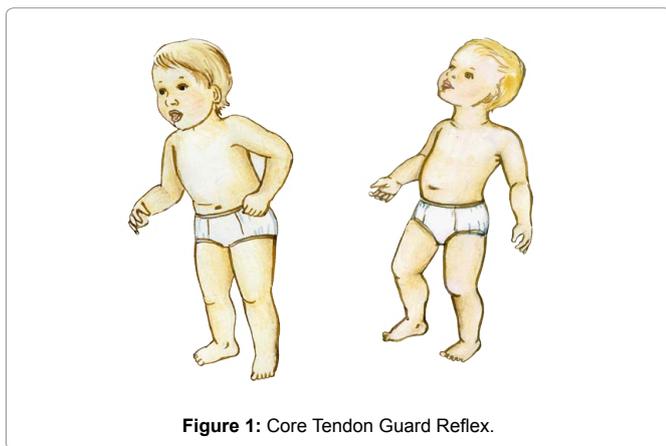


Figure 1: Core Tendon Guard Reflex.

readiness for action. When the freezing, fighting, or fleeing protective strategy works, the reflex response has accomplished its goal and can theoretically return to normal. Our MNRI work with trauma survivors, however, indicates that in 100% of cases the CTGR response is hyperactive for 4 to 12 months after a traumatic event, which means the HPA stress-axis is overproducing stress hormones and the Golgi system is in a chronic state of alarm. These excess hormones can affect neural function by destroying myelin, particularly in the lower motor neurons [30-33], which is responsible for essential life functions such as breathing and circulation.

**The Moro Embrace Reflex:** Moro Embrace Reflex is a response to a sudden loss of stability or change in head position with respect to gravity, as in a fall (Figure 2). The Moro response is linked to fight-or-flight and emerges in utero, is functional at birth, and is active for three or four months. In adults, a sudden loss of stability can trigger Moro, moving their limbs from core to periphery, and periphery to core.

*Defensive function:* the rapid flexion and extension of the Moro reflex can prevent a fall by helping us regain our equilibrium, or prevent serious injury if we do fall by causing us to curl into a ball. Proper maturation of the Moro pattern is important for bonding and trust, coordination of thought and movement, self-control, organization, focus, and comprehension. Our MNRI experience indicates that in 100% of traumatic stress survivors, the Moro pattern is hyperactive for 3 to 14 months after a traumatic event and can continue longer if not released.

**Fear Paralysis Reflex (FPR):** The Fear Paralysis Reflex is active from birth throughout life [34] and is called the startle reflex in adults. Frequently confused with the Moro Reflex, FPR is different in both stimulus and response. FPR is triggered by sudden and intense tactile, auditory, or visual input. Fear Paralysis is a freeze response, unlike Moro which is linked to fight or flight (Figure 3).

*Defensive function:* this reflex activates a strong sympathetic response followed immediately by a parasympathetic one, freezing the whole organism [35]. The rectus abdominis muscles contract, withdrawing the core, the lateral limbs abduct slightly and breathe is held. There may also be flexion of core and elbows, forward head tilt, blinking, a gasp, and knee extension. With traumatic stress, this response does not dissipate as it should because intense and/or long-term stress causes ‘trans marginal inhibition’ [13].

Symptoms such as anxiety, insomnia, fatigue, avoidant behaviors, depression, emotional overwhelm, and dissociation, among so many

others, are all characteristic of the dysfunctional Tendon Guard, Fear Paralysis and Moro Reflexes that we find in patients with PTSD and traumatic stress.

**Negative protection due to trauma and its effect on reflex pattern function**

In MNRI, we refer to the consequences of sympathetic or parasympathetic dominance due to traumatic stress as ‘negative protection.’ Negative protection occurs when, as discussed in above, hyperactive reflexes disrupt self-regulation, intentionality, and cognitive function or hypoactive reflexes do not provide sufficient protection from danger. As tactile sensations provide the stimuli for so many primary reflexes, proper regulation of tactile sensitivity is essential for proper motor responses. Skewed input leads to skewed output.

Trauma does not have to be long-term before it can damage reflex system functioning. The moment of trauma itself can be anchored to reflex patterns, negatively affecting their activation and protective function. Suppose, for example, an infant’s hand is burned grasping a hot object. The grasp motor pattern is then associated with pain. The brain will then avoid pain by avoiding grasping, negatively affecting the development of the Grasp Reflex and delaying further manual skill development.

A reflex may also be anchored to a positive outcome. Suppose a child survives a life-threatening fall due to proper activation of the Moro response, causing the child to roll and avoid injury. This experience will be anchored with the Moro Reflex in another vicious cycle as the avoidance of injury. In the aftermath of trauma, the Moro response becomes mixed with Fear Paralysis, which leads to confused brain processing such that even small stresses trigger excessive fear reactions.

In both of the above situations, the repetitive cycle of reflex activation increases dysfunction in protective responses. Whether the reflex pattern is anchored with a negative experience that led to harm or a positive experience that enabled survival, these responses are

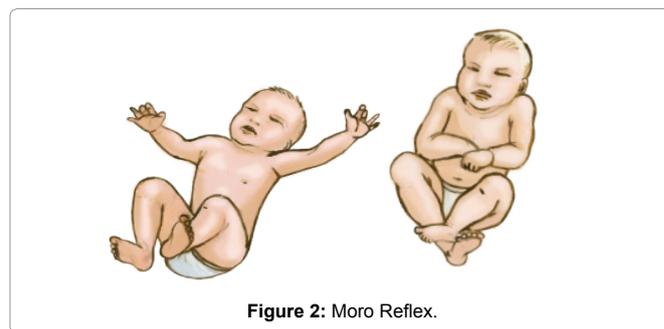


Figure 2: Moro Reflex.



Figure 3: Fear Paralysis Reflex.

connected to the emotion of fear and keep one physiologically locked in a struggle for survival.

### Traumatic stress and dysfunction in the reflex system

Long-term or unbearable traumatic stress can disrupt any of the three parts of a reflex circuit [13,36]. See reflex circuit for Hands Pulling: 1) Transmission of sensory stimuli may be compromised due to altered receptor thresholds, electrical conductivity, or abnormal release of neurotransmitters; 2) Faulty or slow processing at interneuron synapses can occur due to electrical or chemical conductivity issues with the sensory or motor neurons; 3) Poor electrical conductivity in the alpha-motor neuron, which connects with agonist muscle fibers to contract them, or in the gamma-motor neuron, which connects with antagonist muscle fibers to lengthen them, can result in dysfunctional motor response (Figure 4).

Using brain imaging, BAER (brainstem auditory evoked response), and EEG testing [37] we studied individuals with PTSD, leading us to posit a correlation between reflex dysfunctions, immune system function [38], and disharmonious brain waves [37]. We can presuppose that the metabolic dysfunction at interneuron connections is the most critical factor in reflex dysfunction, where insufficient inhibitory neurotransmitters, dopamine and GABA, result in dysregulation throughout the reflex circuit. Such poor regulation can then disturb the whole nervous system, including lower motor neurons, the RAS (where safe and unsafe stimuli should be differentiated), the sympathetic and parasympathetic systems, the territorial and self-preservation instincts of the midbrain, and the thalamus. The amygdala and insula, then, cannot accurately interpret sensory input and, as protection is their first priority, they trigger an

alarm state, initiating a vicious cycle of HPA-stress-axis activation and excess production of stress hormones that further perpetuates the alarm state [9]. Reflex circuits that become hyperactive in chronic stress can overstimulate the HPA-stress-axis even further, and can exhaust the resources of the endocrine, nervous, and immune systems [38].

### MNRI Assessment

In MNRI, we use our Reflex Parameters Assessment [39,40] to determine the functioning of 30 reflexes, the results of which we then use as a guideline for designing a program aimed at improving reflex function. Each reflex receives a specific stimulus, and its response is rated on a scale of 0-20, ranging from deep pathology to above-average function. In infants and young children, we may test the unconditioned reaction, but for older children and adults, we must assess their imitation of the 'ideal' motor response. As an example, for the Moro response, which would normally be triggered by a sudden change in body position, a professional would trigger the response in several ways: inclining the head backwards, rapidly straightening the legs, and providing resistance for both the flexion and extension phases of the motor pattern. Five different parameters of the client's response are then evaluated.

- **Sensory motor circuit:** The integrity of the neural circuit is assessed by noting the sensitivity to sensory stimulus as well as the level of physical response to the stimulus.
- **Sequence and direction:** The fidelity of the motor response to the 'ideal response' is assessed.
- **Timing and speed:** The response should begin a fraction of a second after stimulation and complete quickly enough to fulfill its protective function.

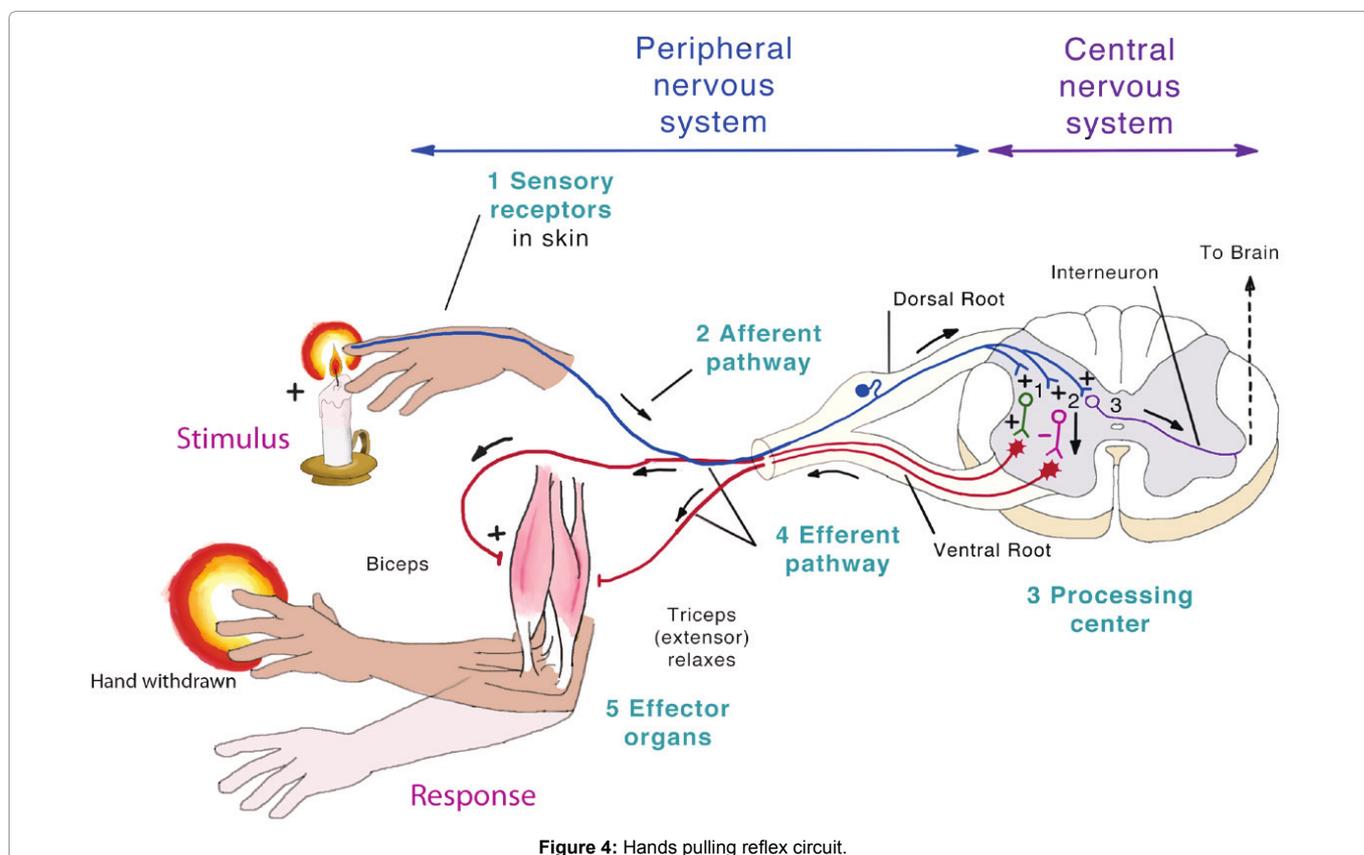


Figure 4: Hands pulling reflex circuit.

- **Intensity:** The level of muscle tone in the motor response should be proportional to the sensory stimulus.
- **Symmetry:** The pattern, sequence, speed, and intensity of the response should be the same on both sides of the body.

Each parameter can receive a possible total of 4 points, yielding a scale of 0-20 points for each reflex. According to Anna Krefft's algorithm [41], a normal response should score 16-17.75 points, 10-11.75 represents the borderline between functional and dysfunctional, and any reflex scoring less than 10 is dysfunctional. Our MNRI Assessment Program analyzes the data and provides us with a profile demonstrating strengths, weaknesses, and tendencies in each of nine reflex pattern clusters:

- 1) Upper Limb
- 2) Tonic
- 3) Body Righting
- 4) Lower Limb
- 5) Gross Motor
- 6) Oral-Facial, Visual, and Auditory
- 7) Protection and Survival Support
- 8) Curiosity and Cognition Support and
- 9) Emotional Stability and Maturation Support [40].

In more than 35 years of clinical observation of individuals with traumatic stress and PTSD, the author has found they consistently exhibit extreme hyper-reactivity in all parameters of the Fear Paralysis assessment. Hyperactive pupil dilation is interestingly combined with a very long latency period between the stimulus and the response, 1½ to 2 seconds, due to transmarginal inhibition [13,36]. The nervous system is numbed in panic and shock and organizes feedback more slowly due to its 'dissociated state' [13], which then conflicts with the hyper-excitation of survival functions in the reflex system.

## Reflex Integration Therapy: History of the MNRI Trauma Recovery Protocol

The exercises and techniques developed by the author, and used for over 25 years now, were originally developed for work with children in states of panic and shock who were in no condition to verbalize their feelings; some had even lost the ability to speak normally. Examples include a child with CP (nonverbal) who survived a fire, a child with Aspergers syndrome run over by a truck, a teenager who stuttered following the witnessing of killings, and children with Down syndrome burned by vandals in Chechnya. These reflex integration exercises were also used with immobile individuals, including one person wounded in Ufa when a train exploded and another with MS who witnessed a murder. Eventually, these techniques were organized into a specific protocol we call the MNRI Trauma Recovery Protocol. This protocol has yielded exceptional results in both children and adults [24,25]. Recently it was used of Newtown shooting survivors (2012), for Philippine Typhoon (2014), and the Flood disaster in Louisiana [42].

### The MNRI trauma recovery protocol

#### Goal setting (verbal aspect)

First, the subject sets a goal for treatment in their own words, such as "My goal is to let go of fear and pain around thoughts of past events. I am open to the changes and good health, and ready to be a winner." The subject is then asked (if they can) to feel the goal in their body-

brain system, and to rate how much they currently identify with the goal on a scale of 0-10 (0 not at all, and 10 completely).

The subject's experience of the goal is then explored with the professional asking, "How does the goal make you feel? When thinking of your goal, can you breathe? See? Listen and hear? Think clearly?" The answers to these questions help the subject to determine where they currently are relative to the states of "I am still in the traumatic event, then and there," and "I am present; I have reached the here and now." This relative position will be reassessed at the end of the session.

MNRI reflex integration can be combined with emotional release work with a psychotherapist trained in MNRI in order to facilitate the exchange of negative sensory-motor anchors with positive ones. Such verbal work, if included, must be in harmony with the nonverbal techniques outlined here.

#### Nonverbal MNRI fast-action trauma recovery protocol [39,40]

**Step 1: Release shock and negative protection:** This first group of exercises reduces reactive responses caused by hyperactive reflex patterns, thereby releasing negative protection.

1) *Tactile Stroking:* brings the subject in traumatic stress back to 'here and now' and awakens them from shock by activating tactility and providing a feeling of safety.

2) *Fear Paralysis:* activates tolerance of sensory stimuli, altering the subject's incorrect perception of neutral stimuli as dangerous, and releases of fear and anxiety, possibly through its effect on the thalamus, amygdala and insula [38].

3) *Moro:* strengthens the subject's protective resources, enabling them to safely open up to their surroundings. Integration of Moro also supports release of fear and anxiety through the thalamus, amygdala, and insula, enabling the subject to perceive more possibilities.

**Step 2: Differentiation-'Be here and now':** The next group of exercises includes reflex patterns involving cross-lateral or asymmetrical movements that enable differentiation of body parts on a kinesthetic level, which then supports conscious control and rational thinking. This physical differentiation becomes the neural foundation for differentiation of concepts: past from present, present from future, and traumatic memory from safe here and now or future possibilities.

4) *Leg Cross Flexion-Extension:* activates proprioceptive pathways governing cross-lateral lower-limb movement and supports kinesthetic differentiation of the lower limbs and hips.

5) *Sequential Arms Opening:* releases the tendency to flex the arms in order to protect the core. The upper part of the body tends to be mostly under conscious control. Opening the arms releases the conscious focus on the traumatic past and hyperactive protection; it also provides a physical metaphor for opening to life and new experiences.

6) *Eye Tracking:* reestablishes regulation in areas of the brain responsible for territorial instinct and self-preservation that become hyperactive during stress by strengthening visual processing skills that are not related to vigilance and scanning for danger.

Optional: *Hands Pulling:* reestablishes coordination of core flexion with visual convergence and trunk extension with visual divergence to alleviate hypervigilance in a visual system that has lost the ability to shift focus appropriately.

**Step 3: Stay grounded and stable:** The next group of exercises are intended to return a physical sense of stability, with the body weight distributed evenly, as well as improved grounding in the present moment and the subject's own self.

7) *Hands Grasp:* raises subject's confidence in their ability to 'hang on' to what is important, to protect themselves, and to feel safe again.

8) *Foot Grasp:* increases subject's feelings of being grounded and safe in their personal space.

9) *Grounding:* same as above.

10) *Foot Metatarsi/Big Toe Rotation:* reestablishes proper body-weight distribution and a feeling of stability.

**Step 4: Regulation of stress hormones: Release excess cortisol and adrenaline:** The next group of exercises is intended to cause the body to release stress hormones and detoxify the overloaded HPA-stress-axis.

11) *Babinski:* redirects the activity of lower motor neurons from hypersensitive tactile receptors, which leads to more accurate sensory processing, better differentiation of pain from neutral touch by releasing the negative association between them, and better grounding. Babinski stimulation also raises the pain threshold and serves as a painkiller.

12) *Perez:* activates micro-movement in the spine and improves circulation of cerebrospinal fluid by promoting normal lordotic curvature, thus releasing stored toxins and stress hormones and calming the HPA-stress-axis.

13) *Abdominal Sleep Posture:* relaxes the body and calms the emotions.

**Step 5: Brain wave activation: maximize your brain potential [37,43].** We use these exercises to activate alpha and beta brain wave patterns to improve function in cognitive activities such as focusing and decision making.

14) *Galant:* releases stress and activates fast alpha and beta brain waves.

15) *Hands Supporting:* activates positive self-protection and alpha and beta waves.

16) *Trunk Extension:* awakens the body, improves concentration and focus, and activates alpha and beta waves.

17) *Foot Tendon Guard:* awakens the Golgi system throughout the body, releases excess muscle tension, and improves focus and awareness by activating alpha and beta brain waves.

18) *Tactile Stroking:* strengthens feelings of connection, belonging, and being present, increases the capacity and tolerance for real life and interactions.

**Claim your goal to finish the procedure:** They are asked to rate their goal again on the scale of 0-10 as they did before.

Again, the professional asks, "What does your goal make you feel now? When you are tuned into your goal and feel an emotional response to it, can you breathe? See? Listen and hear? Think clearly? Act rationally?" The subject compares their responses to their responses before reflex integration treatment. Finally, the subject explores any changes that may have occurred in the present.

### Comparative Analysis of Reflex Pattern Profiles in Children Exposed and Not Exposed to Traumatic Stress

#### Materials and procedures

**MNRI Reflex assessment:** We use the MNRI Exemplary Reflex Pattern Profile of 30 specific reflex patterns to identify possible deviations from normal reflex pattern function. This allows us to compare the level of reflex functionality in children (age 2-19) who experienced traumatic stress and PTSD with that of children who have not experienced traumatic stress. Assessment data of neurotypical children who were not exposed to traumatic stress served as Control Group 1. As mentioned earlier, using the statistical verification method by Prof. Anna Krefft's algorithm [41] on our large bank of statistical data from 1989-2015, we determined that the norm on a scale of 0 to 20 is 16-17.99 points, which allowed us to graduate other results (Table 1).

Thirty reflexes were scored (diagnostic markers coded X<sub>1</sub>-X<sub>30</sub>) using the previously described five parameters, with four features for each. Scores were assigned on a continuous scale of 0-4, with 4 indicating full display of a parameter, and 0 indicating non-display of the parameter, resulting in a maximum score of 20 for each reflex (Table 1) [37,39,43,44]. Comparative results were considered statistically significant at  $p < 0.01$  and not significant at  $p > 0.05$  (Tables 2 and 3).

**Questionnaire of dynamic changes in children's functioning:** We administered a questionnaire to parents and specialists in order to evaluate the dynamics of change in children after MNRI therapy in the following 10 areas: 1) Sensory-motor integration 2) Behavior regulation and self-protection 3) Emotional regulation 4) Self-awareness; 5) Communication/interaction 6) Stress vulnerability/resilience 7) Physical health 8) School skills (reading comprehension, writing, math, etc.) 9) Cognitive processes (attention, memory, thinking, language) and learning and 10) Motivation for achievement and learning [45] (Table 2).

We evaluated the data using a scoring system that ranged from 0 to 20 points, with 0 and 1 denoting the lowest-developed features and 20 indicating normal and very well developed (Table 2). Each statement was rated with one of 5 possible responses: 'normal' display of a function or ability, 'close to norm,' 'some difficulties,' 'major difficulties,' or 'pathological response' (Table 3 and Figure 5).

Table 1: Clinical evaluation: criteria for reflex assessment scores (in points 0-20).

Normal Function		Dysfunction/Pathology	
Points	Level of reflex integration	Points	Level of reflex integration
20	Full/Complete integration	10-11.99	Marginal pathology and dysfunction
18-19.99	Mature and integrated	8-9.99	Incorrect, light dysfunction
16-17.99	Correctly developed-normal	6-7.99	Dysfunction
14-15.99	Functional, but low level of development	4-5.99	Severe dysfunction
12-13.99	Functional, but very low level of development	2-3.99	Pathology
10-11.99	Marginal pathology and dysfunction	0-1.99	Severe pathology

**Table 2:** Reflex pattern profiles of children with neurotypical development exposed to traumatic stress in Newtown (age: 4-19; n=134) and in other events (age 4-19; n=340 individuals) compared to that of children who were not exposed to traumatic stress (age 2-19; 780 individuals).

S. No.	Reflex Patterns (X1-X30)	Children exposed to traumatic stress				Not exposed to traumatic stress
		Newtown tragedy Study Group (n=134)		Other tragedy events Control Group 1 (n=340)		Control Group 2 (n=730)
		Before MNRI Program (1.5 months aftertragedy)	After MNRI Program (9 months after tragedy)	Before MNRI Program	After MNRI Program	No MNRI Program
X1	Core Tendon Guard (CTGR)	9.47 ± 0.76	15.2 ± 0.45 <sup>z</sup>	11.99 ± 0.96	13.32 ± 0.78	15.5 ± 0.45
X2	Robinson Hands Grasp (RGR)	12.58 ± 0.74	16 ± 0.74 <sup>z</sup>	15 ± 0.87	16 ± 1.12	17 ± 0.65
X3	Hands Pulling (HPR)	11.52 ± 0.69	14.8 ± 0.71 <sup>z</sup>	9.5 ± 0.45	14 0.79 <sup>z</sup>	16 ± 0.54
X4	Babkin Palmomental (BPR)	13.68 ± 0.94	14.5 ± 0.74	14 ± 0.87	15.5 ± 0.96	16 ± 0.78
X5	Babinski (BR)	9.65 ± 0.86	14.7 ± 0.84 <sup>z</sup>	14 ± 0.8	15.5 ± 0.77	16.5 ± 0.8
X6	Leg Cross Flex.-Ext. (LCFER)	14.69 ± 0.76	17 ± 0.44 <sup>z</sup>	15.5 0.78	16.0 ± 1.14	17 ± 0.87
X7	Asymmet. Tonic Neck (ATNR)	8.84 ± 0.92	14.5 ± 0.69 <sup>z</sup>	8.5 ± 0.8	12.5 ± 1.1 <sup>z</sup>	15 ± 0.67
X8	Abdominal (AR)	7.53 ± 0.74	14.9 ± 0.69 <sup>z</sup>	9.5 ± 0.87	13.5 ± 0.75 <sup>z</sup>	16 ± 1.04
X9	Bonding (BR)	13.5 ± 0.87	16.5 ± 1.08 <sup>z</sup>	13 ± 0.82	14.5 ± 0.96	15.5 ± 0.65
X10	Foot Grasp (FGR)	11.2 ± 1.11	15.4 ± 0.71 <sup>z</sup>	9 ± 0.47	13.5 ± 0.75 <sup>z</sup>	16.5 ± 0.77
X11	Automatic Gait (TAGR)	14.5 ± 0.75	15.7 ± 0.4	14.5 ± 0.	16.5 ± 1.4	17.5 ± 0.78
X12	Bauer Crawling (BCR)	11.7 ± 1.5	15.83 ± 0.52 <sup>z</sup>	12.75 ± 0.76	15 ± 0.77 <sup>z</sup>	15.5 ± 0.58
X13	Moro Embrace (MR)	10.87 ± 0.87	14.45 ± 1.1 <sup>z</sup>	8.5 ± 0.49	12.5 ± 0.68 <sup>z</sup>	15.5 ± 0.61
X14	Fear Paralysis (FPR)	7.69 ± 0.82	12.85 ± 0.36 <sup>z</sup>	8.5 ± 0.78	12.5 ± 1.14 <sup>z</sup>	14.5 ± 0.45
X15	Hands Supporting (HSR)	7.66 ± 0.84	14.5 ± 0.69 <sup>z</sup>	9.75 ± 0.68	13.5 ± 0.86 <sup>z</sup>	15.5 ± 0.74
X16	Segmental Rolling (SRR)	9.4 ± 0.77	14.7 ± 0.69 <sup>z</sup>	12 ± 0.45	14.75 ± 0.8 <sup>z</sup>	15 ± 0.82
X17	Landau (LR)	9.3 ± 0.78	14.69 ± 0.76 <sup>z</sup>	8.52 ± 0.87	13.75 ± 1.1 <sup>z</sup>	15 ± 0.75
X18	Flying and Landing (FLR)	12.2 ± 1.04	16.2 ± 0.74 <sup>z</sup>	9 ± 0.9	14 ± 1.14 <sup>z</sup>	14.5 ± 0.74
X19	Grounding (GR)	11.5 ± 1.12	15.65 ± 0.52 <sup>z</sup>	9.75 ± 0.78	12.5 ± 0.82 <sup>z</sup>	16 ± 0.78
X20	Head Righting	13.4 ± 0.88	16.4 ± 0.74 <sup>z</sup>	12 ± 0.74	15 ± 0.87 <sup>z</sup>	16 ± 0.79
X21	Trunk Extension (TER)	12.4 ± 0.86	16.3 ± 0.74 <sup>z</sup>	13 ± 0.88	16 ± 0.69 <sup>z</sup>	16 ± 0.65
X22	Symmetr. Tonic Neck (STNR)	9.61 ± 0.79	14.85 ± 1.31 <sup>z</sup>	9 ± 0.96	13.5 ± 0.78 <sup>z</sup>	16 ± 0.64
X23	Spinal Galant (SGR)	9.64 ± 0.92	15.6 ± 0.75 <sup>z</sup>	12 ± 0.71	14.5 ± 1.14 <sup>z</sup>	15 ± 0.87
X24	Spinal Perez (SPR)	9.36 ± 0.93	15.8 ± 0.73 <sup>z</sup>	9 ± 0.78	13.75 ± 12 <sup>z</sup>	16 ± 0.74
X25	Tonic Labyrinthine (TLR)	11.65 ± 0.83	15.65 ± 0.77 <sup>z</sup>	11.75 ± 0.8	14.5 ± 1.5 <sup>z</sup>	16 ± 0.86
X26	Foot Tendon Guard (FTGR)	9.56 ± 0.73	15.63 ± 0.74 <sup>z</sup>	11.5 ± 0.82	14.75 ± 0.6 <sup>z</sup>	15.5 0.73
X27	Spinning	11.63 ± 0.87	15.56 ± 0.66 <sup>z</sup>	9.5 ± 0.81	13.5 ± 0.83 <sup>z</sup>	15 ± 0.93
X28	Locomotion	8.51 ± 0.64	13.76 ± 1.14 <sup>z</sup>	8 ± 0.96	13 ± 0.78 <sup>z</sup>	14.5 ± 0.78
X29	Balancing	12.65 ± 0.83	15.57 ± 0.77 <sup>z</sup>	12.5 ± 0.87	14.5 ± 0.78 <sup>z</sup>	15.5 ± 0.73
X30	Pavlov Orientation	12.54 ± 0.78	16.67 ± 0.55 <sup>z</sup>	12.5 ± 0.91	15.5 ± 0.83 <sup>z</sup>	18.5 ± 0.67
	Legend					
Total	Dysfunctional (6-9.99)	13/43.3%	0/0%	14/46.7%	0/0%	0/0%
	Marginal (10-11.99)	7/23.3%	0/0%	3/10%	0/0%	0/0%
	Very low (12-13.99)	8/26.7%	2/6.7%	8/26.7%	13/43.3%	0/0%
	Lower than norm (14-15.99)	2/6.7%	2/70%	5/16.6%	13/43.3%	15/50%
	In norm (16-17.99)	0/0%	7/23.3%	0/0%	4/13.4%	15/50%

Note: P<0.001

We used an ANOVA test (IBM SPSS Statistics Grad Pack 22.00) and also, the Mann-Whitney U-test, using Statistica (version 6.0; Stat Soft Inc., Tulsa, OK, USA) to do the statistical analysis of questionnaire data; results were considered statistically significant where  $p < 0.05$  and not significant at  $p > 0.05$  (Table 3).

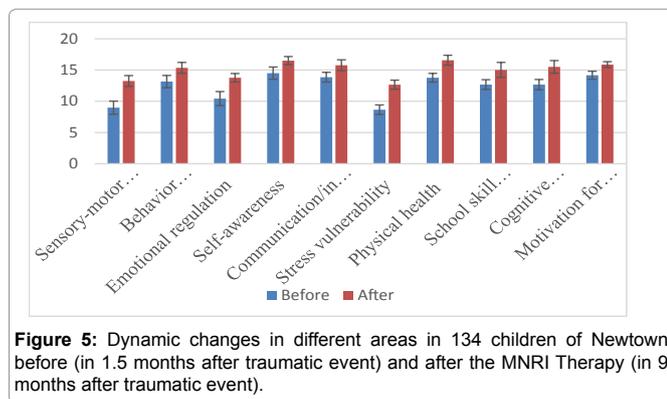
**Study procedure:** This report presents results of reflex assessments conducted for participants: a) exposed to the traumatic events of the shooting at Sandy-Hook School in Newtown (Study Group 1, n=134; data from 2012-2013); b) exposed to traumatic stress in other catastrophes (Control Group 1; n=340; data from 1987-2016); and c) not exposed to traumatic events (Control Group 2; n=730; data of

1989-2015 years). Assessments were administered before and after MNRI Trauma Recovery therapy sessions for the children in Study Group 1 and Control Group 1. Children in Control Group 1 were given the post-assessment in the same timeframe – 1.5 months after intensive 1.5-2-hour sessions, given 1-3 times. Comparison and correlation of changes in their reflex pattern assessment and changes in everyday functioning 1.5 months after the MNRI program was done to see if improvement in reflex function also affected personality aspects, emotional regulation, and cognitive performance. Trained MNRI professionals administered the MNRI Trauma Recovery Protocol based on the pre-treatment assessment data.

**Table 3:** Dynamic Changes in Functioning in 134 Children from Newtown after traumatic event (in 1.5 months) and after the MNRI Therapy (in 9 months).

S. No.	Area/ Cluster	Before	After
1	Sensory-motor integration	8.97 ± 1.06a	13.24 ± 0.87c
2	Behavior regulation and self-protection	13.15 ± 0.98c	15.34 ± 0.87d
3	Emotional regulation	10.43 ± 1.12b	13.76 ± 0.68c
4	Self-awareness	14.5 ± 0.98d	16.5 ± 0.65e
5	Communication/interaction	13.34 ± 0.78c	15.76 ± 0.87d
6	Stress vulnerability	8.65 ± 0.76a	12.65 ± 0.73c
7	Physical health	13.76 ± 0.69c	16.57 ± 0.79e
8	School skill	12.67 ± 0.78c	15.01 ± 1.2d
9	Cognitive processes	12.67 ± 0.82c	15.5 ± 1.01d
10	Motivation for achievement and learning	14.16 ± 0.64d	15.87 ± 0.46d

6-9.79 points	Pathological responses
10-11.79	Major difficulties
12-13.79	Some difficulties
14-15.79	Close to norm (lower than norm)
16-17.79	Normal functioning



**Figure 5:** Dynamic changes in different areas in 134 children of Newtown before (in 1.5 months after traumatic event) and after the MNRI Therapy (in 9 months after traumatic event).

**Ethical approval:** All specialists leading the evaluations were certified by the NIH (National Institute of Health, Office of Extramural Research) “Protecting Human Research Participants” in 2012-2015.

All participants were assigned codes to protect anonymity.

Receipt of informed consent was received from all participants’ parent or legal guardian. MNRI Assessments were conducted and treatment administered by designated Specialists or MNRI Core Specialists who have successfully completed the requirements for Continuing Professional Education in MNRI and clinical hours ([www.MasgutovaMethod.com](http://www.MasgutovaMethod.com)).

## Results and Discussion

### Reflex profile of children exposed to traumatic stress due to other tragic events (Control Group 1)

MNRI assessment data on 340 children exposed to traumatic stress from other tragic events (1989-2013) indicates the deeply problematic condition of their reflexes with all of them scoring between 8.5 (dysfunctional level) and 14.75 points (low level), and their protective reflexes scoring between 8.5 (dysfunctional) and 11.99 points (marginal between dysfunctional and functional): CTGR 11.99 ± 0.96, Hands Supporting 9.75 ± 0.68, Moro 8.5 ± 0.49, and Fear Paralysis 8.5 ± 0.78, and ATNR 8.5 ± 0.8 points when compared with reflex pattern assessment results for children that were not exposed

to traumatic stress (Table 2). After 1-3 treatment sessions with the MNRI Trauma Recovery Protocol, these children (Control Group 1) exhibited significant improvement in all reflex patterns, including CTGR which improved from 11.99 to 12.32 points, Hands Supporting which went from 9.75 to 13.5, Moro and Fear Paralysis from 8.5 to 12.5 points, and ATNR from 8.5 to 12.5 points ( $p < 0.01$ ), with all of these moving them from below to above the margin between dysfunctional and functional. The same tendency toward positive change can be seen in other reflexes as well (Table 2).

### Reflex pattern profiles in children from Newtown (Study Group)

The tragedy that took place at Sandy Hook Elementary School in Newtown, CT on December 12, 2012 affected the entire community. Parents, children, and everyone else in the community experienced shock and significant emotional stress from living with the unbearable images of 20 innocent first-graders and 6 adults, including teachers, teacher’s aides, the school psychologist, and the school principal, being gunned down on an otherwise ordinary school day in their pleasant New England town. Our first visit took place one and one-half months after the tragedy (February, 2013) at the invitation of local families. Seven MNRI specialists volunteered their services and offered the MNRI Trauma Recovery protocol to all who were interested. A total of 279 MNRI therapy sessions were given to 209 children and 76 adults. It was our professional decision to use a nonverbal process in order to avoid any possibility of re-traumatizing our clients through reliving the trauma. We were pleased and honored to have the opportunity to bring this new healing modality to this community in need.

We administered the MNRI Reflex Parameters Assessment to 209 Newtown children ages 4-19 who had experienced direct or indirect traumatic stress. This report focuses on results of our first stage of work with 134 children. Four successive assessments were performed: the first assessment occurring February 2013, 1.5 months after the event; the second April 2013, after 3 months; the third May-June 2013, after 6 months; and the fourth took place October 2013, 9 months after the event. Assessments were performed both before and after treatment with the MNRI Trauma Recovery Protocol. In February before MNRI treatment, reflex pattern profiles of the children from Newtown exhibited similar overall tendencies to those in the profiles of children who experienced other traumatic events (Control Group 2; 1989-

2013): a generally low functional state of reflex pattern expression. For specifics see Table 2. This repeated sequence of assessments and treatments (Table 2) allowed us to measure the dynamics of change in the reflex pattern expression of the Newtown children and to determine which of their reflexes continued to need support.

Comparison of the data from the first and last assessments (9 months after tragedy) of the children's reflex pattern function reveals positive dynamics of change for a large range of reflex patterns, including the protective reflexes: CTGR improved from  $9.47 \pm 0.76$  points (dysfunctional) to  $15.2 \pm 0.45$  (low functional level); Moro  $10.87 \pm 0.87$  (marginal between dysfunctional and functional) to  $14.45 \pm 1.1$  (low functional level); Fear Paralysis  $7.69 \pm 0.82$  (dysfunctional) to  $12.85 \pm 0.36$  (very low functional level); Hands Supporting  $7.66 \pm 0.84$  (dysfunctional) to  $14.5 \pm 0.69$  (low functional level); and ATNR  $7.66 \pm 0.84$  (dysfunctional) to  $14.5 \pm 0.69$  points (low functional level). Previous MNRI clinical work has taught us that if 35% or more of reflex patterns test in the dysfunctional range, symptoms of diagnosable disorders will be present: attention deficit-hyperactivity disorder (ADHD), sensory processing disorder (SPD), autism, cerebral palsy (CP), anxiety, etc. In the 134 Newtown children, an average of 43.3% (13 out of 30) of reflex patterns tested at dysfunctional levels and 23.3% (7) at marginal level between dysfunctional and Low very level following the event, which is similar to what we have seen in children who experienced other traumatic events (in 340 children, an average of 46.6% (14 out of 30) of their reflexes were dysfunctional, and 10% / 3 were at marginal level between dysfunctional and Low very level functioning). Clearly, the children who experienced the Newtown tragedy, either directly or indirectly, experienced a state of physical and emotional shock severe enough to negatively influence their daily functioning and well-being.

By April, after the children received only two sessions of MNRI improvement of reflex functions had started, for example:

1) 12 reflex patterns (40%) moved higher on the functional scale (14-15.99; orange), though still at a lower than normal level: Robinson Hands Grasp, Automatic Gait, Hands Pulling, Leg Cross-Flexion-Extension, Babkin Palmomental, Bonding, Trunk Extension, Head Righting, Galant, Spinning, TLR, and Pavlov Orientation.

2) 10 reflex patterns (33.3%) went up from dysfunctional to a very low functional level (12-13.75 points; pink): Core Tendon Guard, ATNR, Babinski, Foot Grasp, Moro, Bauer Crawling, Spinal Perez, Grounding, Flying and Landing, and Balancing.

3) 6 reflex patterns (10%) moved higher to the marginal level between dysfunctional and functional (10-11.75; purple): Abdominal Sleep Posture, Segmental Rolling, Hands Supporting, STNR, Landau, and Foot Tendon Guard.

4) Only 2 reflex patterns (6.7%) remained dysfunctional at below 10 points (blue)-Fear Paralysis and Locomotion-versus 13 reflex patterns (43.3%) before MNRI therapy.

This large number of reflex patterns (10 of 12, 83.3%) moving from the dysfunctional to the functional range so quickly, accompanied by our observations of behavior and communications, were strong indications that the Newtown children were moving into a more positive future perspective. Before at first sessions (February, 2013), many of the children exhibited a posture of withdrawal (eyes lowered and core flexed). They displayed hypervigilance in both their visual and auditory reflexes and exaggerated dependence upon adults. Following the first treatment, we could see immediate noticeable changes: they

seemed to grow taller (improved Trunk Extension Reflex), made more eye contact, smiled, and some even joked at the end of the session. The children were also able to witness similar changes in the adults. As one little boy said, "Dad, it is so great to hear you laugh again!"

### Dynamic changes in everyday functioning in children from Newtown (Study Group)

Reports concerning the daily functioning of the Newtown children by their parents, grandparents, and relatives (based on answers to the Questionnaire of Dynamic Changes in Children's Functioning: [45] at 1.5 months after the shooting took place (before the MNRI Therapy) indicated evidence of decreased ability in their children in the wake of traumatic stress. The most common complaints and the improvements attributed to MNRI therapy at 9 months post-trauma include the following (Table 3). (Note: improvements due to a particular treatment are of course difficult to assess when other treatments are also used. We tried to control for this by asking parents to report only the changes they attributed to MNRI treatment. While there will be some inevitable inaccuracies, by and large parents and caregivers are generally good at assessing which interventions are affecting their children.)

**1) Sensory-motor integration ( $8.97 \pm 1.06$  points after tragedy  $13.24 \pm 0.87$  points after the MNRI Program in 9 months):** 134 (100%) of children exhibited auditory hypersensitivity, even to neutral sounds; 116 (86.6%) were sensitive to darkness and shadows; 131 (97.8%) had increased tactile sensitivity or intolerance in their 'protective' responses; 119 (88.8%) exhibited a desire to be touched constantly; 76 (56.7%) had worsened motor coordination; 104 (77.7%) exhibited a change in the latency or timing of their reactions; and 56 (41.8%) had their balance affected.

**2) Behavior regulation and self-protection ( $13.15 \pm 0.98$  points after tragedy  $15.34 \pm 0.87$  points after MNRI Program):** 112 (83.6%) exhibited hypervigilance; 112 (83.6%) needed to be reminded of simple routine things; 98 (73.1%) exhibited decreased ability to control their reactions; 109 (81.3%) exhibited decreased tolerance for waiting; 67 (47.8%) were less able to protect themselves; 56 (41.8%) expended too much effort protecting themselves; 41.8% had their balance affected; 74 (55.22%) exhibited increased self-analysis and lack of independence; and 34 (25.4%) refused to do things at home.

**3) Emotional regulation ( $0.43 \pm 1.12$  points after tragedy  $13.76 \pm 0.68$  points after MNRI Program):** 129 (96.3%) exhibited decreased control of emotions; 128 (95.5%) exhibited an excessive increase in sympathy and empathy; 79 (59.0%) were more prone to crying and hysteria; 100 (74.6%) were more prone to worry; 98 (73.1%) exhibited a fear of the dark; 56 (41.8%) exhibited panic attacks; 89 (66.4%) exhibited increased vigilance about the safety of their homes; 45 (33.6%) tended to escape talk about their emotions; 72 (53.7%) exhibited increased impatience, anger, and reactivity in protective emotions; 68 (50.7%); 130 (97.0%) had stopped joking, laughing, and showing enthusiasm; and 76 (56.7%) tried to help their parents with their emotions.

**4) Self-awareness ( $14.5 \pm 0.98$  points after tragedy  $16.5 \pm 0.65$  points after MNRI Program):** 127 (94.8%) seemed less present; 96 (71.6%) appeared too caught up in past images and their own thoughts; 89 (66.4%) exhibited increased suspicion of new people.

**5) Communication and interaction ( $13.34 \pm 0.78$  points after tragedy  $15.76 \pm 0.87$  points after MNRI Program):** 126 (94.0%) exhibited a lack of independence; 109 (81.3%) were less

communicative and/or had stopped sharing; 42 (31.3%) ignored communication; 29 (21.6%) talked too much; 128 (95.5%) wanted parents close at all times; 98 (73.1%) no longer trusted adults' words and concepts; 128 (95.5%) didn't want to play; and 89 (66.4%) focused more on sports and reduced communication to the functional level.

**6) Stress vulnerability and resilience (8.65 ± 0.76 points after tragedy 12.65 ± 0.73' points after MNRI Program):** 116 (86.6%) felt that complaints from stress were permanent; 104 (77.6%) felt vulnerable to neutral or ordinary stimuli; 98 (73.1%) exhibited decreased resilience; 92 (68.7%) were subject to sudden increases in stress; 56 (41.8%) cried easily; 98 (73.1%) were hypervigilant; and 67 (50.0%) experienced breathing difficulty under stress.

**7) Physical health (13.76 ± 0.69 points after tragedy 16.57 ± 0.79' points after MNRI Program):** 59 (44.0%) got cold too quickly; 45 (33.6%) had recurrent headaches; 98 (73.1%) tired too quickly; 39 (29.1%) trembled or perspired too easily with vigorous activity; 68 (50.7%) experienced shortness of breath or a feeling of internal pressure with a need to straighten the body when active; 35 (26.1%) developed an 'irritable bowel'; and 67 (50.0%) had enlarged pupils.

**8) School skills (reading comprehension, writing, math, etc.) (12.67 ± 0.78 points after tragedy 15.01 ± 1.2' points after MNRI Program):** 56 (41.8%) had less focus at school; 116 (86.6%) had to read text several times to comprehend; 48 (35.8%) found the physical act of writing more difficult due to greater muscle tension, tremors, or tiring more easily; and 58 (43.3%) made more mistakes in math and/or exhibited less enthusiasm for their favorite subject.

**9) Cognitive processes (attention, memory, thinking, language) and learning (12.67 ± 0.82 points after tragedy 15.5 ± 1.01' points after MNRI Program):** 122 (91.0%) exhibited decreased ability to focus; 118 (88.0%) over-focused on small details and mere survival; 48 (35.8%) took longer to memorize; 57 (42.5%) experienced much slower thinking; 107 (79.9%) became more literal and missed jokes; 39 (29.1%) exhibited reduction in critical thinking skills; and 49 (36.6%) exhibited reduced vocabulary and a preference for images.

**10) Motivation for achievement and learning (14.16 ± 0.64 points after tragedy 15.87 ± 0.46' points after MNRI Program):** 94 (70.1%) had inconsistent motivation, at times involved, at others less enthusiastic; 89 (66.4%) had to try harder to stay motivated during activities which came naturally prior to the trauma; 97 (72.4%) experienced disorientation in their motivation, distracted by a need to understand the tragedy; (98.5%) experienced a loss of joy; 87 (64.9%) experienced a lack of confidence in setting new goals; and 76 (56.7%) tried to help their parents with their emotions.

The final reports (Table 3) evaluating changes in children's functioning indifferent areas of life and learning after the MNRI therapy training show significant improvement in these areas with  $p < 0.05$ . However, other areas (80%), despite significant improvement at  $p > 0.05$ , still hadn't quite reached the norm after 9 months.

### Warning signals

**Time frame for trauma treatment/recovery:** Despite the noteworthy progress cited in the children's health and well-being, some warning signals can be detected. Complete recovery had still not occurred for Fear Paralysis (12.75 points), Locomotion (13.75), Hands Supporting (9.75), ATNR (14), Abdominal Sleep Posture (14), Segmental Rolling (14), Babinski (14.5), and Landau, (14.5) at the 9-month post-trauma mark. Several possible explanations for this

are: 1) these reflexes may have been less integrated than the others developmentally before the traumatic event; 2) these particular patterns are more vulnerable to long-term or intense stress; and 3) more frequent and/or longer-term work is required for full post-trauma recovery. All of these possibilities highlight the fact that early therapeutic intervention is essential for children who have experienced traumatic stress.

Our analysis indicates that reactivity, muscle tone, and latency/timing of reflex patterns that were hypersensitive and/or hyperactive immediately after trauma may retain this tendency for as long as 9 months, even in children who appear apparently healthy with a positive demeanor, highlighting the continuing importance of neurosensorimotor recovery work for a year or longer, even if the trauma appears to be resolved.

**Importance of early intervention for trauma recovery:** Approximately one-third of the children who received their first MNRI treatment 3 months after the shooting or more already presented with signs of PTSD: dilated pupils, breath holding, poor eye tracking, overactive sympathetic nervous system response, sweaty palms, all over perspiration, and startling or tremors during Fear Paralysis, Moro, or Hands Supporting stimulation. They also reported muscle tension, poor focus at school, distracting memories, desire to escape social interactions, insomnia, and frequent crying or withheld tears. Some were already being medicated for more serious emotional issues. Children who had received MNRI trauma recovery work before 3 months had passed, in contrast, exhibited less overall hypersensitivity in their protective reflexes, less fear, greater presence, reasoning communications that were clearer, and more normal play and laughter. This, like the warning signals discussed above, highlights the importance of early interruption of traumatic stress with reflex re-patterning work.

### Additional Discussion and Summary

The reflex integration work we did with the children of Newtown who were traumatized, either directly or indirectly, by the mass shooting at Sandy Hook School made it clear that their neurosensorimotor reflex integration had degraded to the point where an average of 43.3% of their patterns tested in the dysfunctional range. In MNRI, whenever more than 35% of reflex patterns are dysfunctional we call that reflex integration disorder (RID) [37,46]. The children of Sandy Hook exhibited RID similar to that exhibited by children who witnessed other human catastrophes and natural disasters [7,24,25]. Clearly, with so many of their reflexes compromised, these children were in a state of physical and emotional shock severe enough to negatively influence their daily function and well-being, as was reported by parents and other family members.

The degradation in protective reflex patterns, specifically, Core Tendon Guard (trigger for HPA-stress-axis), Moro ('fight or flight'), and Fear paralysis ('freezing'), also ATNR (audial reactivity) and Hands Supporting (personal space and physical body protection) indicated that children were experiencing chronic stress, lowered resilience, and an impaired ability to protect themselves.

This data affirms the notion that neurosensorimotor reflex integration is an important marker for determining the effects of trauma. Ignoring this marker in cases of traumatic stress and PTSD can mean missing essential work with the survival functions of fight-or-flight and freezing, leading to panic attacks, hypervigilance, transmarginal inhibition, and dissociation.

The MNRI Trauma Recovery Protocol brought about significant changes in the Newtown children's reflex patterns as noted in periodic testing (in every 1.5 months) with corresponding changes in their school skills and daily performance in other areas (tested before the MNRI Program and after 9 months). Improvement in reflex pattern function progressed quickly with MNRI treatment, assuring significant and stable improvement in the children's everyday lives. While considerable improvements were noted in the Fear Paralysis, Moro, Core Tendon Guard, ATNR, and Hands Supporting reflexes, at the 9-month mark further corrective work was still needed to ensure full recovery of these patterns and optimal outcomes, including overall neurodevelopment.

Our work in Newtown highlights the importance of and urgent need for professional facilitation of reflex integration for anyone at risk for chronic trauma or PTSD.

It is interesting to note that for the Newtown children who did not experience work with reflex systems until 3 months or longer after the tragedy, the pace of positive changes and recovery were slower. They exhibited higher levels of chronic stress and less resilience, and sympathetic nervous system dominance (chronic hyperactive Fear Paralysis) was already noted. The children who experienced MNRI within 3 months of the event showed a faster return to functional or normal levels of reflex pattern expression, more normal sympathetic nervous system function, and a faster return to normal life.

Other tools besides MNRI made a big difference for the Newtown survivors too, of course. The outpouring of professional and non-professional care provided necessary healing, comfort, and support. Yet one important piece that is missing from other treatment modalities must be acknowledged: the need to address the unconscious and involuntary physiology of positive survival and protection, which are inherently built in reflex system. The more we know about the automatic responses of our protective and survival mechanisms, the more helpful we can be. In order to affect the 'lower' brain function and its connection with the HPA-stress-axis, we must work on the nonverbal level of tactile, vestibular, and proprioceptive processing with reflex patterns (programmed units enhancing survival and neurodevelopment), breathing (to physically remove the universal feeling of 'internal pressure'), and the visual and auditory senses.

Although this article is limited to reflex patterns in children and does not address those of adults (our next planned article), it is interesting to note the difference between the adults and children of Newtown in expression of one particular reflex pattern. The children demonstrated hypo-activity for Hands Supporting, while their parents showed a hyperactive response mixed with Bonding: Instead of extending their arms straight, they adducted as though 'encircling' a child. Seeing this amazing physiological manifestation of the adults' need to protect the young was poignant. Our team members were profoundly affected by the depth of the parents' impulse to save their precious children even while they themselves were in shock.

The concepts discussed here, and the improvements noted, are not just dry statistical information for the author and the MNRI team. These numbers represent fallout from an unspeakably tragic event which touched us all personally, and with this report it is our goal to offer a treatment modality that can lead survivors of such dark events away from their pain and senseless loss and on toward inner peace, hope, and a positive vision of the future. Early intervention is key for our professional work, which is designed to promote neurosensorimotor reflex integration. More than rising scores on

assessments, our success is measured by renewed health, joy in life, deep restorative sleep, resilience, and optimism.

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## References

1. Hamblen J, Barnett E (2011) PTSD in Children and Adolescents.
2. Harold Cohen (2016) Treatment of PTSD.
3. Leitch ML, Vanslyke J, Allen M (2009) Somatic experiencing treatment with social service workers following hurricanes. *Soc Work* 54: 9-18.
4. Carlson J, Chemtob CM, Rusnak K, Hedlund NL, Muraoka MY (1998) Eye movement desensitization and reprocessing (EMDR): Treatment for combat-related post-traumatic stress disorder. *Journal of Traumatic Stress* 11: 3-24.
5. Beck JS (2011) Cognitive behavior therapy: Basics and beyond (2nd Edtn) The Guilford Press, New York, 19-20.
6. Getz I (2012) Trauma-Focused Cognitive-Behavioral Therapy — Hope for Abused Children.
7. Masgutova S (2015) Reflex Integration for Post-Trauma Survival and Recovery.. A Collective Work. Florida, USA: SMEI: 70-91.
8. Cannon WB (1931) Again the James-Lange and the thalamic theories of emotion. *Psychological Review* 38: 281-295.
9. Selye H (1974) Stress without distress. J B Lippincott Co., Philadelphia, USA.
10. Roxo MR, Franceschini PR, Zubaran C, Kleber FD, Sander JW (2011) The Limbic System Conception and Its Historical Evolution. *ScientificWorldJournal* 11: 2428-2441.
11. Eifert GH, Forsyth JP (2005) Acceptance and Commitment Therapy for Anxiety Disorders, New Harbinger Publications, Oakland, USA.
12. Roemer L, Orsillo SM (2009) Mindfulness- and Acceptance-Based Behavioral Therapies in Practice. The Guilford Press. New York, USA.
13. Asratian E A (1983) Selected works. Reflexive theory of high nerve system activity. Moscow, Russia: Science. 328 p.
14. Podachin VP (1983) Features of the scientific creativity of E. A. Asratian (on his 80th birthday). *Usp Fiziol Nauk* 14: 3-13.
15. Milad MR, Quirk GJ (2002) Neurons in medial prefrontal cortex signal memory for fear extinction. *Nature* 420: 70-74.

16. Morgan MA, Romanski LM, LeDoux JE (1993) Extinction of emotional learning: contribution of medial prefrontal cortex. *Neurosci Lett* 163: 109-113.
17. Mesulam M (2000) Principles of cognitive and behavioral neurology (2<sup>nd</sup> Edtn). Oxford University Press, New York, USA.
18. LeDoux JE (2003) The Emotional Brain, Fear, and the Amygdala. *Cell Mol Neurobiol* 23: 727-38.
19. Quirk GJ, Russo GK, Barron JL, Lebron K (2000) The role of ventromedial prefrontal cortex in the recovery of extinguished fear. *J Neurosci* 20: 6225-6231.
20. Aggleton JP (1992) The Amygdala: Neurobiological Aspects of Emotion, Memory and Mental Dysfunction. Wiley-Liss, New York, NY, USA.
21. Bremner JD (2002) Does Stress Damage the Brain? Understanding Trauma-related Disorders from a Mind-Body Perspective. WW Norton, New York, USA.
22. Bremner JD (2006) Traumatic stress: effects on the brain. *Dialogues Clin Neurosci* 8: 445-461.
23. Shin LM, Rauch SL, Pitman RK (2006) Amygdala, medial prefrontal cortex, and hippocampal function in PTSD. *Ann N Y Acad Sci* 1071: 67-79.
24. Masgutova S, Curlee P (2007). You are a winner. Trauma recovery. A new choice through natural developmental movements. Revised. Edition, 1st World Publishing, Iowa, USA: 105.
25. Masgutova S, Curlee P (2015). You Are a Winner. A Collective Work. Florida, USA: SMEI: 526-539.
26. Grecia AS, Lopez KN, Comagon M, Whiteside D (2015) Post-Traumatic Stress Protocol for Filipino Typhoon/Earthquake Survivors. A Collective Work Florida, USA: SMEI: 540-546.
27. Herman J (1992) Trauma and recovery: from domestic abuse to political terror. : Pandora, London, UK.
28. van der Kolk BA, Roth S, Pelcovitz D, Sunday S, Spinazzola J (2005) Disorders of Extreme Stress: The Empirical Foundation of a Complex Adaptation to Trauma. *J Trauma Stress* 18: 389-399.
29. Pavlov IP (1927/1960) Conditioned reflexes: An investigation of the physiological activity of the cerebral cortex. Dover Publications Inc, New York, USA.
30. Sechenov IM (1995) Physiology of behavior. M.G. Yaroshevsky, Moscow, Russia.
31. Bremner JD, et al. (1995) MRI-based measurements of hippocampal volume in combat-related post-traumatic stress disorder. *American Journal of Psychiatry* 152: 973-978.
32. Bremner JD (2001) Hypotheses and controversies related to effects of stress on the hippocampus: An argument for stress-induced damage to the hippocampus in patients with post-traumatic stress disorder. *Hippocampus* 11: 75-81.
33. Sherin JE, Nemeroff CB (2011) Post-traumatic stress disorder: the neurobiological impact of psychological trauma. *Dialogues Clin Neurosci* 13: 263-278.
34. Baldacara I, Jackowski A, Andreoli, SB, Mello MF (2011) Reduced cerebellar left hemisphere and vermal volume in adults with PTSD from a community sample. *Journal of Psychiatric Research* 45: 1627-1633.
35. Kaada B (1986) Sudden Infant Death Syndrome-The Possible Role of 'the Fear Paralysis Reflex'. Norwegian University Press, Oslo, USA: 56.
36. Sechenov IM (1960) Selected physiological and psychological works. Foreign Languages Publishing House, Moscow, Russia.
37. Pilecki W, Masgutova S, Kowalewska J, Masgutov D, Akhmatova N, et al. (2012) The impact of rehabilitation carried out using the Masgutova neurosensorimotor reflex integration method in children with cerebral palsy on the results of brain stem auditory potential examinations. *Adv Clin Exp Med* 21: 363-371.
38. Masgutova SK, Akhmatova NK, Lebedinskaya OV (2013) Clinical-Immunological Assessment of Therapy Effect of the Neuro-Sensory-Motor Integration Program of Reflex Patterns in Airway Chronic Inflammatory Diseases. Event Abstract, International Congress in Milan, Front Immunol Conference Abstract: 15th International Congress of Immunology (ICI).
39. Masgutova, S. (2011). Infant dynamic and postural reflexes. Orlando, USA: SMEI.
40. Masgutova S, Masgutov D (2015) MNRI® Assessment for Determining the Level of Reflex Development. A Collective Work. Florida, USA: SMEI: 201-209.
41. Krefft A (2007) Diagnosis of functions of invisible phenomena (Statistic Mathematic Analysis). Wrocław.
42. Graham Ulkins (2016) Healthline: Trauma clinic for flood victims.
43. Masgutova S, Masgutov D, Akhmatova N, Akhmatov E (2015) Neurophysiological Foundation of the MNRI® Reflex Integration Program. A Collective Work. Florida, USA: SMEI: 31-40.
44. Myles B, Huggins A, Rome-Lake M, Maleia H, Taku B, et al. (2003) Written language profile of children and youth with Asperger syndrome: From research to practice. *Education and Training in Mental Retardation and Developmental Disabilities* 38: 362-369.
45. Masgutova, S., (2016). The Questionnaire of Dynamic Changes in Children's Abilities.
46. Masgutova S, Masgutov D (2015) Reflex Integration Disorder as a New Treatment Paradigm for Children with Autism. A Collective Work. Florida, USA: SMEI: 171-180.

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