

## Flood Trauma Survival and Recovery Using MNRI Reflex Neuro-Integration Therapy

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### Abstract

This study presents the results of trauma therapy with 79 Louisiana flood survivors in August 2016 when their state was impacted by catastrophic flooding. There were over 30,000 people evacuated, 13 deaths, and over 146,000 homes, schools, and businesses damaged.

A team of fifteen MNRI specialists set up Trauma Recovery clinics in Baton Rouge and Lafayette, LA for children and adults. The purpose was to work with the innate reflex patterns activated negatively by stress and trauma that aid in protection and survival and to reduce the reactive work of the HPA stress axis and overloading stress hormones in the body, allowing the neurological system to self-organize and increase resilience. The work was non-verbal and targeted sub-cortical areas of the brain and peripheral nervous system to avoid "re-victimization" (via building a negative narrative) and release trauma through the extrapyramidal nervous system.

The survivors of the flood demonstrated dysfunctional reflex patterns in: Core Tendon Guard (trigger for HPA-stress-axis), Moro (fight or flight), Fear Paralysis (freezing), ATNR (auditory reactivity), and Hands Supporting (personal space and physical body protection) indicating that these children and adults were experiencing traumatic stress, lowered resilience, and an impaired ability to protect themselves. The use of the MNRI method demonstrated improvements in the reflex functions in children from  $7.58 \pm 0.59$  points (dysfunctional level) to  $14.86 \pm 0.64$  points ( $p < 0.05$ ) and in adults from  $8.78 \pm 1.21$  points to  $15.91 \pm 0.82$  ( $p < 0.05$ ). Comparisons were made with a similar study done with survivors of the Newtown, CT school shooting in 2013.

**Keywords:** Flood trauma recovery; Survival; Protective reflexes; Core tendon guard; Moro; Fear paralysis; Hands supporting; ATNR-Asymmetric tonic neck; MNRI

### Introduction

Post-trauma recovery needs professional facilitation information, techniques and strategies based on knowledge of the specific type of disaster or catastrophe, and the stage of trauma relief, which is appropriate to work with both adults and especially with children. This knowledge and techniques are not currently available for those in the area of helping disciplines such as psychology and psychotherapy, mental health counselling, education, neurology, psychiatry, pharmacology, and other areas.

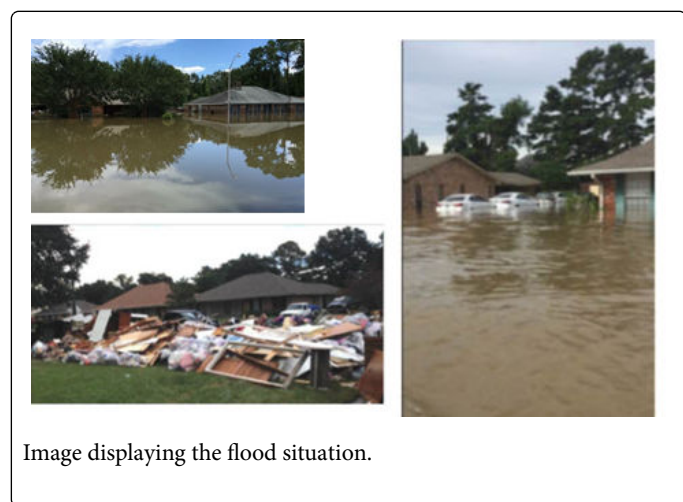
The specifics of the work with survival of trauma caused by wars, shootings, violence, loss of close friends and family are described in

literature [1-3]. As for the post-trauma concerning survival in floods or tsunami catastrophes, little valid information is available. However, there are some informative studies that show the horrors of flood trauma equals other types of traumatic stress in catastrophes [4,5]. Still the available information in literature presents a descriptive aspect of the problem rather than research data or evidence and treatment based on individual procedures. The development of the trauma recovery concept and methods presently available are only at the beginning stage and lack early post-trauma intervention tools for survivors who have experienced traumatic stress, especially for children.

The statistics show that flooding represents about 40% of all natural disasters in the USA [6]. Overall traumatic stress costs American industry more than \$300 billion annually. Literature published from 2004 to 2016 according to review of the Health Protection Agency (HPA) indicates that flood tragedies affecting people of all ages can

provoke mental health problems, post-traumatic stress disorder; depression and anxiety disorders, substance misuse and other [7,8].

In August 2016, the state of Louisiana was impacted by a slow-moving rain system that resulted in catastrophic flooding in the areas of Baton Rouge and Lafayette. The US Government evacuated an estimated 30,000 people to shelters in churches and sponsored by the Red Cross. Civilian boat owners known as the 'Cajun Navy' rescued at least an additional 1000 people using their boats to retrieve people who put calls out *via* social media for help. The flooding resulted in 13 deaths and destroyed or damaged over 146,000 homes, schools, and businesses. An estimated 30% of students in Louisiana were out of schools at the beginning of the academic year. The trauma and stress to those who lost their home, belongings, jobs, and possessions was immeasurable. The majority of those participating in the free MNRI sponsored Trauma Recovery clinics had lost everything they owned due to the floods. Many of them were evacuated in the middle of the night without warning due to waters rising in their homes. Several had to wade out of water that was chest deep in the middle of the night carrying whatever they could. At least one who participated in this study was rescued from her roof by helicopter. Several teachers who participated and lost their homes expressed anxiety over not only losing their own homes, but not knowing how their students were surviving. Many expressed feelings of anxiety and stress about cleaning out their homes and seeing their possessions on the side of the road as trash. Children who participated in the MNRI sessions expressed concerns about their schools and missing the first days of school and reuniting with their friends and teachers. The majority of those served in this study were staying in shelters or with family members.



A group of fifteen MNRI specialists and associates joined their colleagues in Louisiana by setting up and participating in free Trauma Recovery/PTSD clinics in Baton Rouge and Lafayette, LA to offer trauma recovery for those impacted by the flooding. In Baton Rouge and Lafayette, the MNRI teams set up in the clinic and worked with 79 survivors-children and adults. The teams received training by Dr. Svetlana Masgutova in Reflex Integration for those experiencing post-traumatic stress. The purpose of the strategies used in the clinics was to work with the innate reflex patterns negatively activated by stress and trauma that aid in protection and survival. The goals for working with reflex patterns were to prevent and reduce the reactive work of the HPA stress axis and overloading stress hormones in the body, allowing for the neurological system to achieve self-organization, and for resilience to rise in the face of on-going stress. The work done was

primarily non-verbally and targeted sub-cortical areas of the brain and peripheral nervous system to avoid re-victimization *via* building a negative narrative. The purpose of the work the MNRI teams participated in was to work with innate patterns of the subcortical areas of the brain in order to avoid longer termed chronic trauma or PTSD.

The multidisciplinary group of professionals working in this study dealt with trauma release and recovery through the units of the extrapyramidal nervous system, the reflex patterns that are given genetically as a recovery mechanism to our brain-body system.

Based on literature and over 30 years of MNRI work, it has been found that if people's psychosocial needs after flood trauma are met by their families, close friends and communities, smaller proportions of people are likely to require specialized mental healthcare [9]. The distressing experiences that the majority of people experience transiently or for longer periods after flood disasters, as after any other disaster, can be difficult to distinguish from symptoms of common mental disorders [7]. Common mental health problems following disaster include depression, anxiety disorders such as posttraumatic stress disorder (PTSD), generalized anxiety disorder (GAD), panic disorder (PD) simple phobias, complicated grief, and substance misuse. These disorders may be newly developed in the aftermath of this disaster or may represent exacerbations of existing or remitted mental health disorders. Guilt, anger, somatization, sleep and related problems may exist alongside, or independently of, these diagnosed conditions.

When reviewing the MNRI data, the importance of work with secondary stressors from the prolonged psychosocial impacts of flooding was noted. Emphasis needs to be given to reduce the impact of primary and secondary stressors on people affected by floods and the importance of narrative approaches to differentiate distress from other mental disorders. Much of the literature on post-traumatic stress disorder, diagnosable depressive and anxiety disorders, and substance abuse are under-represented in the published data. Finally, there are a number of methodological challenges that arise when conducting research when analysing and comparing data on the psychosocial and mental health impacts of floods. There is no 'one size fits all' program when looking at strategies and techniques to use with this population. Careful assessment of specific presenting problems is important to individualize interventions. Some programs that are currently in use include PFA, SPR, exposure, TFCBT, and EMDR (not an extensive listing). The psychological first aid [9], an evidence-informed approach to assisting people in the immediate aftermath of disaster [10], is now internationally recognized as the recommended intervention. The PFA is based on five empirically supported principles to guide post-disaster interventions: (a) promoting sense of safety; (b) promoting calming; (c) promoting sense of self and community efficacy; (d) promoting connectedness; and (e) instilling hope (The US National Center for PTSD; [www.ncptsd.org](http://www.ncptsd.org), [7]; f) skills for Psychological Recovery is gaining considerable international attention [8].

As described, the data available rarely addresses the neurodevelopmental aspect of work with survivors. Moreover, the methods of work with children with post-trauma described in current publications often presents a metaphysical imitation of treatments created for adults, and are not reflective of the specific needs of children for survival and recovery. The data and information in this study is based on the understanding that any trauma can shift the mental-emotional-perceptual realm and physical existence of an individual to the level of survival. At this level of survival, the

extrapyramidal nervous system and its sympathetic aspect becomes dominant when cortical functions are not easily available to the survivor, with the result of emotional and behavioural reactivity, and fears and protective responses become the main activity of the 'mind-body' system [11-14]. Thus, the use of conscious oriented consulting or psychosomatic technologies oriented directly at the cortical processing of the input and reactivation of cortical control over one's own behavior, emotions, and cognitive processes in post-stress or trauma is not enough and may actually lead to ineffective practices and strategies.

In trauma and post-trauma, a helping professional needs tools for 'calming down' the body-mind system on a neurophysiological level to reactivate and assure the availability of resources for positive survival. The knowledge of work with the extrapyramidal system (peripheral nerve system, brainstem, and diencephalon) is needed for this, as the extrapyramidal system is designed by nature to naturally produce automatic responses and reflexes that are used in stress and trauma situations. Stress has an effect on the way reflex patterns function in trauma and creates the anchoring of memories, developing negative protection, worry, fear and phobias which can deeply affect the normal work of the nervous system. 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 (excessive activation of freezing and/or flight-or-flight mechanisms) and limited ability to make rational decisions.

MNRI assessment data was gathered on the reflex pattern functions of individuals who experienced the flood disaster in Louisiana in 2016. The Study Group (n=79) included children (n=34) and adults (n=45) whose results were analysed and compared with assessment data on survivors of another catastrophe, the Newtown Shooting including a Control Group 1 (n=210) with children (n=134) and adults (n=76), along with those individuals functioning typically with no history of traumatic stress-Control Group 2 (n=1086) including children (n=730) and adults (n=356).

The comparative analysis of the participants in this study demonstrated positive changes in their reflex pattern functions, stress resilience, and their daily life functions in the Louisiana children and adults who received the MNRI Trauma Recovery protocol and demonstrated similar positive changes on the level of statistical significance as the individuals of the Newtown tragedy.

### **Post-trauma survival and recovery using the MNRI Reflex Integration concept and therapy modality**

Individuals who survive disasters often are left imprinted with the memories of the terrifying images which can last their entire lives. These individuals often anchor negative protection responses in their brains and amygdala, specifically in the area responsible for fear and worry. Due to this information about trauma, its effect on the individual, and the apparent increase of the prevalence of trauma, it is very important to create discussion of the efficacy and validity of different treatment modalities, especially with respect to infants and children. The best-known primary treatments for traumatic stress and PTSD today include psychotherapy for emotional adjustment, medication for symptom relief, and alternative interventions such as Peter Levine's Somatic Experiencing [15], Francine Shapiro's Eye

Movement Desensitization and Reprocessing (EMDR) [16], and other forms of energy work. The main treatments for children include Cognitive-Behavioral Therapy-CBT [17] and Trauma-Focused CBT-TF-CBT. Both of these treatment programs 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. Over the past years, the experience of the author and the team of MNRI Specialists who have worked with disaster and catastrophe survivors all over the world have brought them to the conclusion that current primary treatments are not adequate for survivors of trauma. The team's experience in helping these survivors with their traumatic stress release and recovery processes has led them to understanding the importance of addressing the unconscious and neurosensorimotor integration needs of those with traumatic stress and PTSD [14]. While it can be helpful to survivors to address cognitive and emotional functioning with psychotherapy and to use pharmaceutical support aimed at the somatic consequences of the traumatic shock and the release of tension and pain in the muscular-tendon system, these interventions often do not lead to complete recovery. The above mentioned interventions do not guarantee transition from a state of negative protection to one of positive protection. The move towards positive protection can lead to a change in perspective, with a new sense of life and well-being.

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 modality is particularly beneficial for children in trauma (though it works well for adults as well) and unlike 'talk therapy' which requires cortical involvement, it directly addresses the extrapyramidal and subcortical brain structures that become dominant in stress, with the consequences of over-reactivity and limitation of rational decisions.

Trauma symptoms originate in automatic 'freeze' and 'fight or flight' responses [18-24]. 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. The reflex system enables survival through the extrapyramidal nerve system, brainstem functions (including peripheral nerve system, and spinal cord), the interbrain (basal ganglia, thalamus, amygdala, insula, and limbic system), and the cortex [18,25,26,21,27-32,22,23]. 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 [33,24], leading to possible Reflex Integration Disorder (RID) [34]. 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, behaviour, 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 shocked 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 study reports the results of assessment and initial MNRI therapy work done on a voluntary basis by the MNRI Team with 79 Louisiana flood survivors including 34 children and 45 adults directly involved in the tragic flood in June, 2016. This voluntary work was



documented on local TV (Vicky Roy on WAFB about Clinic for flood victims/Part 1).

This comparative analysis of reflex pattern function and development data in these children and adults before and after use of the MNRI Trauma Recovery protocol demonstrates significant positive changes in their reflex pattern function.

### **Traumatic stress vs. Normal stress response**

The human organism is designed to withstand 'normal' stresses of everyday life, and is capable of dealing with a wide variety of stressors using the genetic decoding resources of the body. Stress is a non-specific response of the whole organism, which is the result of the effect of different extreme factors potentially dangerous for homeostasis, characterized by stereotypic changes in functions of the nerve and endocrine systems [20], and involves every organ, tissue and cell in the protection response. Defining this state Walter Cannon [19] used the term 'Alarm State', which was explained [20] as the activity of the autonomic-sympathetic nervous system's trigger for the 'adrenaline storm' in the circuit of the HPA-stress-axis (hypothalamus-pituitary-adrenals), resulting in typical stress symptoms of: shallow and rapid breathing, a fast heartbeat, trembling, sweating, and other automatic body responses. Energy goes to the limbs to enable freeze, escape, or self-defence (fight or flight). During stress the 'Alarm State' is controlled by the parasympathetic nervous system, which is designed to calm down the excitatory processes in brain-body system. When this stress reduces, this system brings the organism back to a normal 'Non-Alarm State' and saves the organism's 'homeostasis', a balance of all processes and health. This cycle of transition from Non-Alarm State to Alarm State and back to Non-Alarm State in trauma vs. normal stress may require more effort from the nervous system to cope, and at times fails when a stressor exceeds the resources of the HPA-stress-axis and the amygdala to decode the harmful stimulus.

Whenever the level of stress becomes overwhelming, beyond the body's ability to cope and the nervous system to interpret, the individual enters the realm of trauma, which means that a normal stress response is replaced with more serious symptoms such as: anxiety, panic, poor sleeping patterns, relationship difficulties, intense unbearable flashbacks, hyper vigilance, and emotional numbness. These are the same symptoms usually present in PTSD. PTSD can exist co-morbidly with other disorders, such as anxiety disorder, depression, and/or addictions. Those who have experienced long-term trauma such as prolonged child abuse frequently exhibit complex PTSD, which can accompany personality or dissociative disorders or extreme behavioral, emotional, and/or mental difficulties [23,35,22].

In this study, the term traumatic stress is used to indicate the presence of symptoms in the aftermath of a traumatic event in cases where an official diagnosis of PTSD or DESNOS (Disorder of Extreme Stress Not Otherwise Specified) has not been made.

### **Sympathetic "Trans-marginal" Excitation in Traumatic Stress**

In cases of overwhelming danger with no hope for survival or difficult survival, the sympathetic system becomes reactive bringing as much input as possible to the protective centers of the brain so that they do 'not miss dangerous information' and leads to 'trans-marginal' excitation. This is a level of excitation that is not possible to control cortically or sub-cortically [36,37,24]. During this excitation the HPA-stress-axis works extremely hard to release stress hormones which

activate and alarm the body to increase the level of fight and flight response. This increased excitation increases the levels of adrenaline and cortisol or noradrenalin which can poison and kill the neurons of the nervous system, which can lead to a real state of PTSD. Other processes also take place during this time in order to prevent the inhibitory parasympathetic system to control the over-exceeding excitatory processes which releases large amounts of inhibitory substances in amounts higher than normal. These inhibitory substances trigger 'trans-marginal' inhibition or a freeze response which pushes hard on the individual and may cause one to collapse, faint, or dissociate from one's body. Both trans-marginal excitation and inhibition are damaging factors to the human nervous system. As result of such damage more significant symptoms may appear and persist such as: intense memories, tremors, poor balance, unstable gait, blocked breathing, and muscle tension. A healthy individual can shift unexpectedly into a trans-marginal parasympathetic-mediated state within a few days or weeks demonstrating passiveness, apathy, lack of interest in surroundings, indifference, and loss of old values.

### **Trauma: protective reflexes for survival in flood catastrophe**

Post-trauma is the non-rational automatic responses that originate in the nerve networks of the reflex patterns systems. These reflex pattern systems enable survival through the extrapyramidal nervous system, brainstem functions (including the peripheral nervous system and spinal cord), the interbrain (basal ganglia, thalamus, amygdala, insula, and limbic system), and the cortex [25,26,21,27-29,30-32,22,38]. Traumatic or unbearable stress may damage the neurons of reflex circuits. Several PTSD studies indicate that when 5-10% of the neurons of the reflex circuits of the extrapyramidal system are damaged post-traumatic disorder MAY OCCUR [33,1], and Reflex Integration Disorder-RID) may appear [34]. There are two possible reasons for RID: 1) Traumatic stress disrupts the underlying sensory-motor circuit links, resulting in disorders in the extrapyramidal nervous system and insufficient reflex functions, and 2) Damaged stress resilience.

The unbearable traumatic stress, which can be sudden, acute, or prolonged in time or frequency, can disrupt any of the three parts of a reflex circuit [36,1]. These three parts include: 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 in the gamma-motor neuron, and connects with antagonist muscle fibers for lengthening the muscle which may lead to dysfunctional motor responses.

### **Reflex function in flood catastrophe vs. shooting massacre tragedy**

The normal stress response can 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, consist of three parts: sensory stimulation, central nervous system (CNS) processing, and a motor or postural response. These automatic reflex responses are the keys to our survival, our genetic and epigenetic birthright, ensuring nervous system stability in stress [39].

Primary reflex development begins in utero and continues through the first two-three years of life, with emergence, development, and maturation of sensorimotor circuits associated with reflexes. Reflexes are essential for future sensory, motor and postural, behavioural and emotional, and cognitive development [1]. The MNRI method focuses mainly on using the protective functions of these reflex patterns to improve stress resilience, neural connectivity and neuroplasticity. For example, the Tendon Guard, Moro, and Fear Paralysis reflexes are linked to the HPA-stress-axis for direct life-saving action-reaction. There are also reflexes that serve us during the time of stress or right after the occurrence of the incident to find the means for relief from the stress and optimize homeostasis. When these reflex patterns bring relief and help to establish homeostasis, order is able to return to normal and become a part of the recovery tools. These reflex patterns include Hands Supporting, Hands Grasp, ATNR, Automatic Gait, and others. In this study the focus will be given to the Tendon Guard, Moro, Fear Paralysis, Hands Supporting, and Asymmetrical Tonic Neck (ATNR) reflex patterns.

These reflex patterns are genetically designed patterns to handle the alarm system caused by stress and they are the most vulnerable to damage when stress becomes traumatic or chronic; thus, they are the ones most likely to become dysfunctional after traumatic stress and in PTSD. Any program of work with survivors must use this data as a true deep neurophysiological recovery process. This is why this study uses the MNRI programs to address the concept of the neurosensorimotor reflex integration, which has been used for over 30+ years with great success in work with survivors of other catastrophes and disasters by Dr. S. Masgutova and her team (the Chernobyl nuclear disaster (1986-1996); the Baku conflict (1990-1991); the earthquake in Armenia (1988); the train crash in Ufa (1989); the Chechen War (1996-1999); conflicts in Israel (2001-2005); massacre shooting in Newtown, CT (2013-2014), Philippines earthquake and typhoon (2014-2015), Louisiana Flood (2016); also survivors of large accidents, explosions, and abuse [14,40-42] (Figures 1-5).

Brief description of main functions: Depending on type of stressor and the decision of the brain, the Moro or Fear Paralysis reflex patterns are then correspondingly triggered. In traumatic stress the TGR deals with a much more complicated task of whether to create 'trans-marginal' excitation or inhibition. I. Sechenov says the TGR's job is to take care of survival of the nerve cells and this is why it can be strongly anchored and functions as the 'key for survival'. TGR also is not easily regulated back to a normal state and keeps the HPA-stress-axis in the mode of a chronic 'activator'. The reactive HPA-stress-axis needs, in its turn, its own tools which are reflexes to protect the organism in real action. This kind of 'vicious circuit' is the sign of being stuck in trauma and the traumatic past. Thus, specialized work must be done to assist the individual to come out of such negative neurophysiological-neuropsychological anchors. In many cases, survivors of traumatic events cannot easily reach these anchors on their own or possibly not at all because, as will be shown in this study, knowledge of this works with survival mechanisms must be applied.

The TGR is expressed in two reactions with corresponding postures: freeze (over-flexion of the core or 'Red Light' TGR), and fight-flight (over-extension of the trunk or 'Green Light' TGR) [20]. The freeze response causes a stop of any motion, holding of breath, and visual convergence. The fight-flight response creates the readiness for reaction, rapid breathing, and visual divergence. When the freezing or fight-fleeing protective responses have been accomplished, TGR returns the muscular-tendinous system and body posture to norm.

**Protection function:** The stress stimulus for the TGR triggers the reticular activating system (RAS) and amygdala of the diencephalon after decoding the stress input to find out whether a real threat exists. If so, it triggers the HPA-stress-axis and activates the entire organism for protection causing contraction of flexor or extensor muscles.

**Specifics in trauma:** The trauma survivors that have received MNRI work after different catastrophes demonstrated that in 100% of the individuals, the TGR response was hyperactive for 4 to 12 months after a traumatic event. This means that the HPA-stress-axis was in an alarm state and increased the production of stress hormones to exceed the norm. Overproduced stress hormones can destroy the myelin sheath in neurons axons, particularly those in the lower motor neurons [26,37] brainstem [43,44], and cerebellum [45], which conducts the life-essential functions such as the defensive mechanisms, circulation, and breathing.

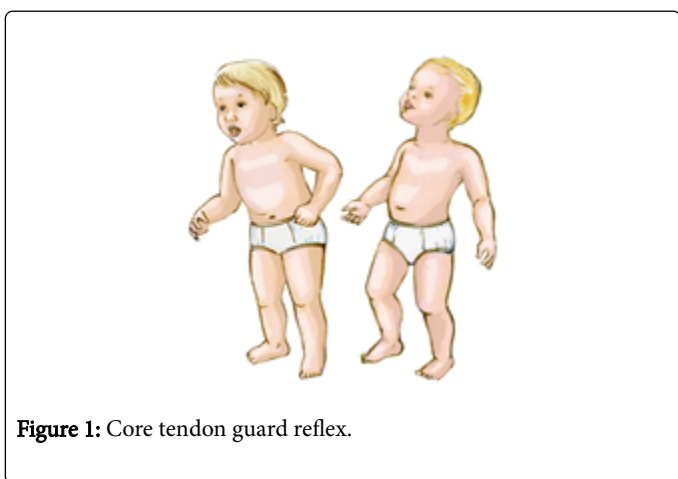


Figure 1: Core tendon guard reflex.

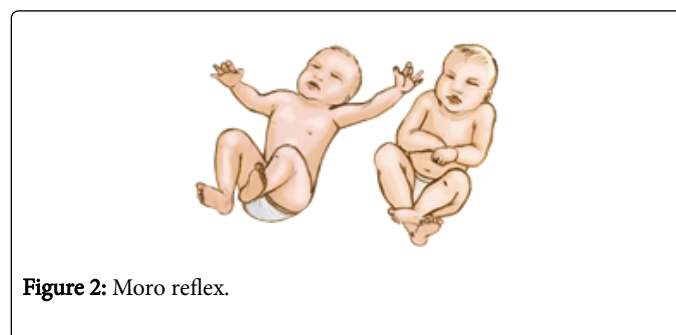


Figure 2: Moro reflex.

### The Tendon Guard Reflex (TGR)

**Definition:** the TGR is a response of the muscles and tendons by strong contraction to stress stimulus based on the HPA-stress-axis over-activation because of input of a specific stressor input. This reflex presents a generalized response of the organism and muscles, whose task is to help the brain to make the decision whether to activate the fight and flight (excitatory processes of the sympathetic nerve system) or freezing (inhibitory processes of the parasympathetic system).

### The Moro Reflex

**Definition:** The Moro Reflex is a fight-flight response to a sudden loss of a stable body position in space or unexpected declining of the head to 30 degrees backwards. This reflex pattern movement is accompanied by the following movements: a) Phase-One-opening the core by extending the trunk backwards, moving the limbs away from

center to periphery, and inhaling rapidly, then holding the breath; b) Phase-Two-closing the core by flexing the core and all limbs to the center, and exhaling rapidly, followed by holding the breath again (See Figure 2); c) Phase-Three, which includes embracing with their arms, legs, and core, an adult/parent or other soothing object such as a stuffed animal.

**Brief description of main functions:** Moro in an infant is active from birth, particularly from two to four months, and it trains the fight-flight response for proper protection in future stress situations concerned with loss of gravity. In adults, the response of this reflex pattern is activated when falling down creates a situation where transition from one phase to another helps to keep the body's equilibrium.

**Protection function:** the rapid flexion and extension in the Moro reflex pattern can prevent a fall by helping to regain our equilibrium, or prevent serious injury if a fall does occur by bringing the whole body into a safer ball shape. Proper maturation of the Moro pattern is important for development of equilibrium and posture control, coordination of thought and movement, feelings of safety, bonding and trust, regulation of one's own impulsive behaviours and emotions, focusing, and decision making.

**Specifics in trauma:** In the survivors that the MNRI team has worked with, 100% of them of differing traumas were found to display hyperactive Moro patterns, which was prolonged for 3 to 14 months, or longer, after a traumatic event, when no reflex integration stress-release work was given [46].



Figure 3: Fear paralysis reflex.

### Fear Paralysis Reflex (FPR)

**Definition:** The Fear Paralysis reflex is a life-long reflex and serves us throughout our life by protecting us by freezing our bodies, inhibiting movements, and is called the Startle Reflex in adults [47]. FPR is an automatic response for sudden and intense auditory, visual, or tactile input dangerous for survival. FPR is linked to inhibiting reaction in situations of danger, unlike Moro which is a dynamic response, based on the fight-flight response (See Figure 3).

**Brief description of main functions:** A normal FPR is active and matures neurologically by age of three, and eventually becomes a startle response in adults. The main biomechanics of this reflex pattern consists of: withdrawing the core (rectus abdominal muscles contract suddenly), lateral limbs abduct slightly-holding the balance of the core/trunk to keep body in equilibrium, and the breath is held. There may also be flexion of core and elbows, forward head tilt, knee extension, blinking, and a gasp [46].

**Protection function:** This reflex pattern triggers a strong sympathetic response (excitation) followed immediately by a parasympathetic one (inhibition), freezing the whole body [48]. The FPR slows basic functions of respiration, heartbeat, and ameliorates

sensations of discomfort, preserving resources to provide effective protection for the whole body [46].

**Specifics in trauma:** With traumatic stress, the FPR response may anchor the survival experience and use it as the key for coping with the dangerous experience and turns it into trans-marginal inhibition with chronic use [26]. Trans-marginal inhibition can damage the neurons of the nerve system, especially the extrapyramidal nervous system [33].

In trauma and post trauma the FPR is frequently mixed with the Moro Reflex which means they are activated simultaneously without proper differentiation of the sensory (FPR) or proprioceptive (Moro) systems. This lack of differentiation confuses the decoding system of the brain and re-traumatizes the system causing intense trans-marginal inhibition expressed in behaviours such as panic attacks when anything reminds them of the dangerous stimulus.

Symptoms such as anxiety and fear, insomnia, fatigue, avoidant behaviours, depression, emotional overwhelm, and dissociation are some of the characteristics of a dysfunctional FPR. These symptoms may also be related to the Tendon Guard and Moro Reflexes patterns in individuals with PTSD and traumatic stress [46].



Figure 4: Hands supporting reflex.

### Hands Supporting

**Definition:** The Hands Supporting Reflex is triggered when a loss of stability in a vertical position occurs (such as when sitting or standing). In an infant, it happens when a baby is held underneath both arms and moved toward a horizontal surface/ground-their arms automatically extend with hands/palms open to reach the surface.

**Brief description of main functions:** The Hands Supporting Reflex helps to develop equilibrium in the body, spatial awareness, and the arms-head-body links for protection when falling down. It is important in the development of arm coordination, exploration, and establishing personal boundaries. Also, Hands Supporting provides for the formation of the arms-hands-fingers-eyes coordination necessary when dealing with obstacles, emotional stress, and the development of manual gross-motor skills for manipulating large objects.

**Protection function:** The Hands Supporting Reflex helps to protect the head and upper body with the palms and fingers oriented medially acting as shock absorbers. When functioning properly, this reflex pattern also serves as the means for regulating HPA-stress-axis functions for stress management and territorial behaviour regulation.

**Specifics in trauma:** When the survivors of the Louisiana flood were assessed, 98% of them did not demonstrate a functioning Hands Supporting Reflex pattern. In fact, this reflex pattern fell at the dysfunctional level. Even with up to 10 repetitions of the proper motor

pattern for this reflex, the survivors were not able to satisfactorily reproduce the pattern. These survivors consistently used the Upper Aquatic pattern instead of a Hands Supporting pattern. Our interpretation of this response was that it was not safe to use the Hands Supporting pattern for falling down safely in the flood situation, with hands oriented to the ground as it would lead to drowning. In this situation, the brain actually changed Hands Supporting Reflex pattern to another pattern which was more protective for the particular situation and established itself on the automatic level within the extrapyramidal system. However, once the catastrophic event was over, the brain response for the stimulus of Hands Supporting was incorrect and mixed for the Aquatic Reflex pattern.

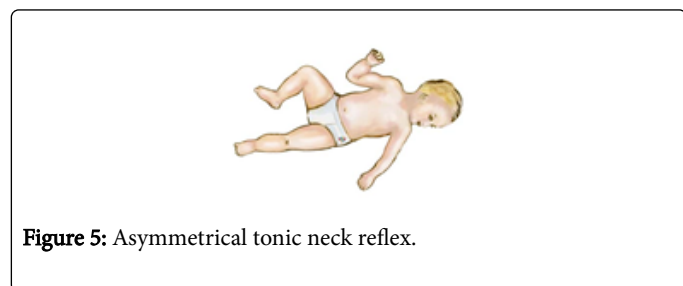


Figure 5: Asymmetrical tonic neck reflex.

### Asymmetrical Tonic Neck Reflex (ATNR)

**Definition:** The ATNR is elicited by reflexive and passive head turning to the side resulting in the limbs extending on the same side of the body to which the head is turned, while the limbs on the opposite side are flexed.

**Brief description of main functions:** The ATNR reflex is active until 4-6 months old and matures between 6-7 months. It is designed genetically for training the acceleration (head turning to the side triggering speed, equilibrium, body rotation mechanisms, space orientation (proprioceptive-vestibular system) and muscle tone regulation of spine and limbs control. It also helps with auditory perception and language development. When the head turns to the right, the ATNR ‘teaches’ our system to activate the executive functions of the left hemisphere: auditory discrimination, classification of sounds in language, decoding, comparisons, analysis, conscious control of the auditory-speech and auditory-visual coordination systems, expressive language, and fine motor-coordination. In head turning to the left, the ATNR supports the executive functions of the right hemisphere: auditory coding, comprehension, automatic oral-motor control,

subcortical connections, receptive language, emotional memory, and other gestalt functions [14].

The influence of ATNR maturation on cognitive function is that it serves as the neuro-structural basis for activation of alpha and beta brain waves. These fast frequency brain waves allow access to executive functions such as auditory coding-decoding, auditory short-term memory, and activation of neurological pathways between the Wernicke and Broca brain centers for speech and language. It also effects the development of fine and gross motor coordination systems.

**Protection function:** This reflex serves as equilibrium for protection when falling down and rolling over or falling from a standing position; stabilizes the body when rotational movements take place; protects the auditory canal by resetting binaural hearing to monaural hearing during stress and danger; discrimination of auditory ‘figure and ground’; and prioritizing sound.

**Specifics in trauma:** The Assessment of the ATNR reflex pattern in Louisiana flood survivors demonstrated that 87% of them had a dysfunctional reflex response.

### Ethical approval

All specialists leading the MNRI Program were certified by the Svetlana Masgutova Educational Institute for Neuro-Sensory-Motor and Reflex Integration and worked as volunteers. All participants were assigned individual 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 had successfully completed the requirements for Continuing Professional Education in MNRI and clinical hours (www.MasgutovaMethod.com).

### Materials and Procedures

#### Evaluation tools

MNRI Reflex Assessment scores 30 reflex patterns (diagnostic markers coded X1-X30). Five of these protective reflex patterns are the focus of our discussion in this paper: Tendon Guard, Moro, and Fear Paralysis serving for activation of the HPA-stress-axis (alarm system), and Hands Supporting and ATNR acting as the ‘means’ for survival. The main parameters for the evaluation include:

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 1: Clinical Evaluation: Reflex Assessment Scores Criteria (in points 0-20).

**Sensory-motor circuit:** the neurophysiological circuit components coherence-sensitivity to sensory stimulus and physical response to the

stimulus; 2) sequence and direction: the identity of the motor-postural response to the ‘ideal model’ response; 3) latency of nerve



transmission: the time frame of the response that must happen within a fraction of a second after stimulation and be quick enough to fulfill its protective function; 4) intensity: proper muscle tone regulation in the motor response proportional to intensity of the sensory stimulus; 5) symmetry: the equality of the circuit function, sequence/direction, latency, and intensity of the response on – the right and left sides of the body [49,50-53].

Scores were assigned on a continuous scale of 0-4 points with 4 indicating full display of a parameter, and 0 indicating non-display of the parameter, resulting in a possible maximum total score of 20 points for each reflex on a scale of 0 to 20. A normal response should score 16-17.99 points, 10-11.99 represents the borderline between functional and dysfunctional, and any reflex scoring less than 10 is dysfunctional according to Anna Krefft's algorithm (see Table 3) [54].

The primary interest of this study is to investigate what improvements in reflex patterns, if any, on post-Reflex Assessments of those who participated in the MNRI Trauma Recovery Protocol. Evaluations of sensory-motor patterns oriented toward neurophysiological norm and age coherence.

The MNRI Assessment Program analysed the data and provided a profile demonstrating strengths, weaknesses, and tendencies in each of five reflex patterns of the flood survivors, which was used by specialists for positive work with survivors in their recovery process. This data was used to also show principal differences in reflex patterns that functioned differently in survivors of flood in comparison with those who experienced other types of catastrophes (shooting/war).

The evaluation of the data from this study also used the MNRI Reflex Assessment Exemplary Reflex Patterns Profile which is statistically verified by the New Krefft Method [54] based on a large bank of statistical data (1989-2016) of MNRI work with individuals exposed and not exposed to different catastrophes (see Tables 2 and 3).

## Therapy modality

**MNRI trauma recovery protocol:** The MNRI Trauma Recovery Protocol used in this study with the survivors of the flood disasters was based on the concepts of Neurosensorimotor Reflex Integration techniques comprised of a sequence of steps which is the same protocol used with the survivors of other catastrophes [46]. These Neurosensorimotor Reflex Integration techniques present the Protocol, known as the MNRI Fast-Action Trauma Recovery Protocol. The following steps are followed in this protocol:

**Preparation:** Goal Setting includes work on a verbal level, if not hindered by age, unconscious or a shocked state of mind.

Step 1. Move Out of Re-Action into Action (Preparatory Exercises). Goal is to prepare the body-brain system to reduce reactivity and nervousness/anxiety through physical movements. Technique: Trunk Extension.

Step 2. Open for Deep Breathing. Goal is to reduce reactivity and open breathing resources. Technique: Breathing Activation.

Step 3. Release shock and negative protection. Goal is to reduce reactivity of reflex patterns and the HPA-stress-axis elicited by shock. Techniques: Tactile-Proprioceptive System Activation, Fear Paralysis, Moro.

Step 4. Space-Time Differentiation: "Be Here and Now". Goal is to restore the abilities for differentiation in internal representative system of: the past from present, present from future, and traumatic memory

from safe 'here and now' or future possibilities. Techniques: Leg Cross Flexion-Extension, Sequential Arms Opening, Eye Tracking.

Step 5. Stay Grounded and Stable. Goal is to return to a physical sense of stability with body weight distributed evenly, as well as improved grounding in the present moment and the individual's own self. Techniques: Hands Grasp, Foot Grasp, Grounding.

Step 6. Regulation of stress hormones. Goal is to release excess stress hormones (cortisol and adrenaline) and detoxify the overloaded HPA-stress-axis. Techniques: Babinski, Perez.

Step 7. Brain wave activation: Goal is to maximize your brain potential by increasing alpha and beta brain waves to improve function of cognitive activities such as focusing and decision making. Techniques: Galant, Hands Supporting, Foot Tendon Guard, Tactile Stroking.

Step 8. Be Open to Well-Being. Goal is to direct the mind-body system to normal functioning, health, and to 'give permission' to oneself for joy. Technique: Landau.

Finish: Claim Your Goal to finish the procedure. Goal is to anchor positive results of the session and to orient toward long-term perspectives and achievements.

## Results and Discussions

### MNRI reflex restoration after trauma

The results and interpretation of this study (below) shows the specifics of the protective reflex functions in trauma and survival from the flood catastrophe and how these correlate with stress resilience. Particularly, the description of the Tendon Guard, Moro, and Fear Paralysis reflex patterns which serve for activation of the HPA-alarm-axis system and the Hands Supporting and ATNR reflexes used by the body-brain system to relieve stress and return back to normal are presented. The effect of the MNRI Method on improvement of reflex patterns and stress resilience is also discussed.

**Tendon Guard Reflex (TGR):** Specific of the TGR in flood survivors. In the MNRI work with the survivors of the Louisiana floods it was found that 100% of children and adults had hyperactive TGR and they were easily frightened by a physical response of tightening the muscular-tendinous system with any sudden proprioceptive stimulus. Also, 94% of these survivors demonstrated a freeze response with the effect of being in a prolonged state of shock. The majority of the survivors in this study (97%) presented these responses: withdrawal/flexion of the core, lack of motion, and shallow or blocked breathing. They used more visual divergence *vs.* convergence, with convergence being the natural response for core flexion. These survivors experienced fear (which was a conflict between the posture and emotional responses caused by too much tension in the body), preparing for a bigger, unexpected stressor (such as the threat of even deeper water, inability to remain stable in the water, terror of drowning, electrical shock in water), and rapid and shallow breathing. The fight-fleeing protective response was 'accomplished' when they reached dry ground, however these survivors reported that for the next few weeks their brain continued to struggle with this phenomenon. It is important that this negative anchor be resolved so that it does not continue to provide an overwhelming defense in their life. Many of the participants in this study experienced a long struggle in the water before reaching dry ground. They were exhausted by then which switched on their freezing mechanism instead of allowing for rest.



These responses indicated that the HPA-stress-axis was still in an alarm state, pushing the stress hormones well beyond normal limits. These survivors also demonstrated the following: an absent/blank mind, slow response to questions, difficulty following instructions, being easily frightened, and excessive crying. In other words, they were overproducing stress hormones at a level that could destroy their neurons, specifically the neurons in the lower motor areas [26,37,43-45]. Their reflex patterns were affected, showed incorrect functions (see other reflex characteristics below) and were in need of special assistance. The TGR in flood survivors was dysfunctional at an 8.74 point level. There are some differences in features of the TGR in individuals that could and could not swim for different reasons: not able to swim, fear of water, or poor swimming skills. Individuals that had good swimming skills were stuck in the Trunk Extension pattern, while those who could not swim were stuck in the Core Flexion pattern.

**Specifics of the TGR in shooting survivors:** The TGR in Newtown survivors corresponded to the basic characteristics of the pattern: withdrawal/flexion of the core (Red Light TGR), lack of motion,

shallow and poor breathing, easily frightened, excessive crying, and fear of falling asleep. The Newtown survivors also showed excessive visual divergence vs. convergence, with the same expression as of conflict with the motor-postural aspect of it. But what was different in comparison of the LA flood survivors with results in the Newtown survivors was that the extension in TGR in the flood survivors was reached easier than in Newtown survivors.

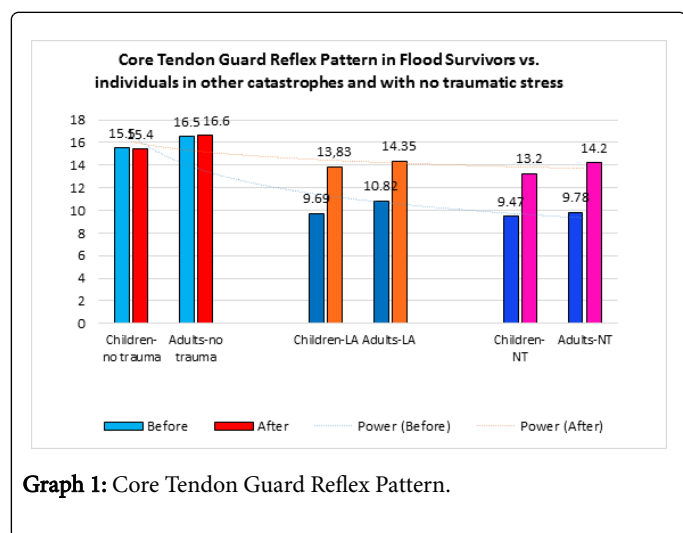
The analysis of reflex patterns in survivors of different catastrophes gave information in understanding the need for restoration of the reflex patterns on a deeper level and promises a better chance for improvement/success. The example of such analysis is given below (Table 4).

Many of these features described above changed in flood survivors after the MNRI Trauma Recovery Protocol. See the Table 2 that presents the results before and after the MNRI program (Graph 1).

These changes mean that the MNRI procedure was effective for trauma survivors.

Reflex	Core Tendon Guard Reflex in Flood Survivors vs. individuals in other catastrophes and with no traumatic stress					
	Norm (n=1086)		Flood survivors (n=79)		Newtown survivors (n=210)	
Event						
Age group	Children (n=730)	Adults (n=356)	Children (n=34)	Adults (n=45)	Children (n=134)	Adults (n=76)
Before	15.5 ± 0.45	16.5 ± 0.63	9.69 ± 0.82	10.82 ± 1.21	9.47 ± 0.76	9.78 ± 0.81
After	15.4 ± 1.23	16.6 ± 0.96	13.83 ± 0.36*	14.35 ± 0.64*	13.2 ± 0.45*	14.2 ± 0.92*
P			<0.05	<0.05	<0.05	<0.05

**Table 2:** The results of Tendon Guard Reflex assessments before and after the MNRI program.



**Graph 1:** Core Tendon Guard Reflex Pattern.

**The Moro:** Individuals who received strategies by the MNRI team experienced different types of traumas. The flood survivors and the survivors of shooting massacre both demonstrated a hyperactive and dysfunctional Moro response in 97% of the children and in 91% of adults during the first two months after their trauma. The Moro was anchored as a main survival mechanism for any 'safe' or 'unsafe' motion under their feet (instability) and led to intense muscle tension

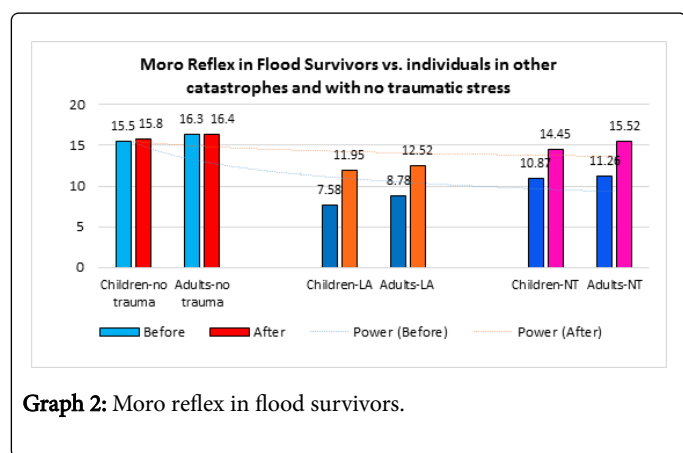
in the body. These dysfunctions were also caused by confusion between the Moro and Fear Paralysis responses due to the sudden change of position in space, the mixture of freeze and fight-flight responses, the nature of the catastrophe itself with sounds of the gun shooting, shouting, screaming, and bodies being thrown. The same dysfunctional effect of Moro was seen in survivors of the flood catastrophe and other disasters. Special MNRI work was done to release the tendency for confusing the types of protective responses. The Moro Reflex became less hyper-sensitive and helped the overworking HPA-stress-axis significantly; allowing for the reestablishment of inner peace. The work with the Moro pattern is used in MNRI to develop stress resilience (Table 3 and Graph 2).

**Fear paralysis reflex (FPR):** The work with individuals who experienced traumatic stress from the LA floods and the Newtown, CT shootings both demonstrated a dysfunctional level of the Fear Paralysis pattern. This was seen in survivors of the flood catastrophe and other catastrophes. The effect of the confused Moro and FPR was an unbearable stress and confused protection which was later became expressed in their tendency to stay stuck in the memory of the trauma. This tendency evidently was not released by itself until special work was done with Fear Paralysis and Moro Reflex patterns to calm down the oversensitivity and overworking of the HPA-stress-axis. With the use of the MNRI reflex re-patterning procedures cortisol and norepinephrine release was reduced leading to a faster recovery from the incorrect use of the patterns. Professionals use the Fear Paralysis

and Moro Reflex re-patterning exercises to release the negative effect of stress and to develop stress resilience.

Reflex	Moro Reflex in Flood Survivors vs. individuals in other catastrophes and with no traumatic stress					
	Norm (n=1086)		Flood survivors (n=79)		Newtown survivors (n=210)	
Event	Children (n=730)	Adults (n=356)	Children (n=34)	Adults (n=45)	Children (n=134)	Adults (n=76)
Before	15.5 ± 0.61	16.3 ± 0.48	7.58 ± 0.59	8.78 ± 1.21	10.87 ± 0.87	11.26 ± 0.84
After	15.8 ± 0.87	16.4 ± 0.56	11.95 ± 0.74*	12.52 ± 0.64*	14.45 ± 1.1*	15.52 ± 0.86*
P	>0.05	>0.05	<0.05*	<0.05*	<0.05*	<0.05*

**Table 3:** The results of Moro Reflex Assessment in individuals before and after the MNRI program.

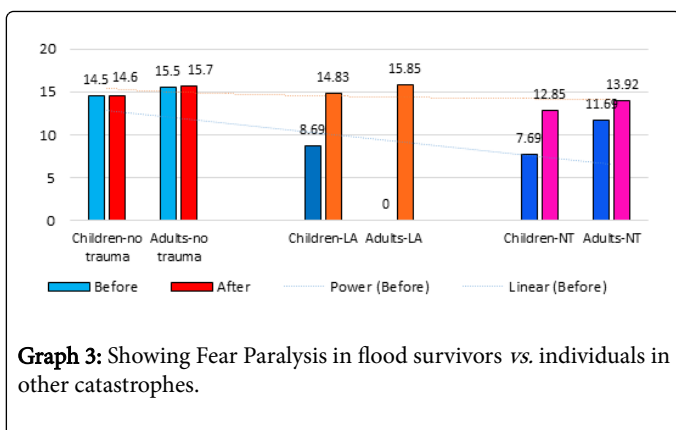


**Graph 2:** Moro reflex in flood survivors.

The work with individuals who experienced traumatic stress in the shooting tragedy demonstrated a dysfunctional level of Fear Paralysis pattern responses in 96% of the children and in 92% of the adults. The FPR was found to be hyperactive and mixed with Moro which meant that these survivors' protective functions were always 'on' without differentiation of the nature of the stimulus. This was interpreted to signify that they were functioning at 'survival at any cost'. The nervous system is numbed in panic and shock and organizes feedback more slowly due to its 'dissociated state' [26] which then conflicts with the hyper-excitation of survival functions in the reflex system (Table 4 and Graph 3).

Reflex	Fear Paralysis Reflex in Flood Survivors vs. individuals in other catastrophes and with no traumatic stress					
	Norm (n=1086)		Flood survivors (n=79)		Newtown survivors (n=210)	
Event	Children (n=730)	Adults (n=356)	Children (n=34)	Adults (n=45)	Children (n=134)	Adults (n=76)
Before	14.5 ± 0.45	15.5 ± 0.83	8.69 ± 0.82	9.82 ± 1.21	7.69 ± 0.82	11.69 ± 1.24
After	14.6 ± 0.36	15.7 ± 0.53	14.83 ± 0.36*	15.85 ± 0.64*	12.85 ± 0.36*	13.92 ± 0.48*
P	>0.05	>0.05	<0.05*	<0.05*	<0.05*	<0.05*

**Table 4:** The results of Fear Paralysis Reflex Assessment in individuals before and after the MNRI program.



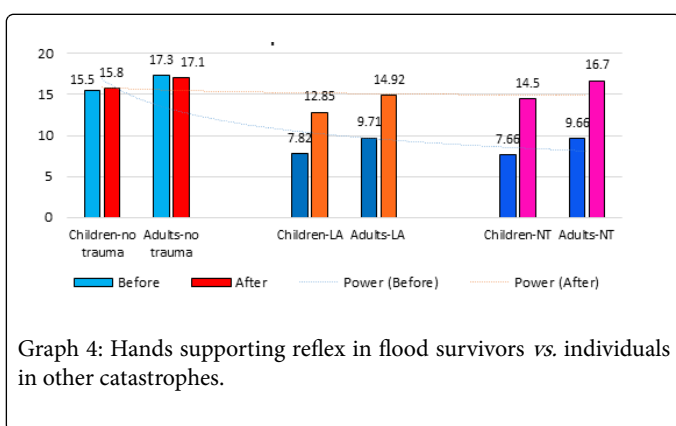
**Graph 3:** Showing Fear Paralysis in flood survivors vs. individuals in other catastrophes.

**Hands supporting:** The assessment of the Hands Supporting reflex pattern in Louisiana flood survivors demonstrated that 98% had a dysfunctional working pattern which fell into the critical category. Even with up to 10 repetitions of professional demonstration of the proper pattern, this reflex pattern was resistant to change and attempts at reassessment did not show a positive change. The usual re-patterning procedure did not improve the pattern fast enough. The

MNRI team continued to investigate the situation until they discovered the reason for this lack of change. This investigation found that the survivors were using another response for the stimulus given to elicit the Hands Supporting; they were using the Upper Aquatic reflex pattern. The only explanation that followed was that use of usual Hands Supporting pattern was unsafe, as falling down with their hands towards the ground was not effective saving their life and would lead to drowning. Thus the brain's decoding system 'changed' the pattern for a safer one which compensated by using swimming movements of the upper limbs. This compensation is very logical and extremely protective and presents on an automatic level (by the extrapyramidal system). The problem which was noted after the catastrophe was that the brain response that triggered the Hands Supporting reflex pattern was incorrect and mixed the stimulus with reality. The brain was holding on to a catastrophic pattern which was a negative anchor holding the person in the stress from the flood and preparing them to be ready for being surrounded with water. The MNRI team created a transitional plan for the Hands Supporting exercises based on the Upper Aquatic response. The effect of these new exercises immediately showed a positive effect proving the hypothesis concerning the compensation of the Hands Supporting by Upper Aquatic reflex (Table 5 and Graph 4).

Reflex	Hands Supporting Reflex in Flood Survivors vs. typical individuals and survivors in other catastrophes					
	Norm (n=1086)		Flood survivors (n=79)		Newtown survivors (n=210)	
Event						
Age group	Children (n=730)	Adults (n=356)	Children (n=34)	Adults (n=45)	Children (n=134)	Adults (n=76)
Before	15.5 ± 0.74	17.3 ± 0.74	7.82 ± 1.22	9.71 ± 0.94	7.66 ± 0.84	9.66 ± 0.67
After	15.8 ± 1.24	17.1 ± 0.24	12.85 ± 0.72*	14.92 ± 1.43*	14.5 ± 0.69*	16.7 ± 0.58*
P	>0.05	>0.05	<0.05*	<0.05*	<0.05*	<0.05*

**Table 5:** The results of Hands Supporting Reflex Assessment in individuals before and after the MNRI program.



**Graph 4:** Hands supporting reflex in flood survivors vs. individuals in other catastrophes.

The Hands Supporting reflex pattern functions differently depending on the source of the stressor and is negatively affected by traumatic stress no matter what the catastrophe and functions differently in each case. The negative changes in the Hands Supporting reflex pattern was noted in 94% of the survivors. In the Newtown adult survivors, Hands Supporting reflex pattern was noted as hyperactive with an over-crossed pattern at the body midline, but in children it was hypoactive. 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.

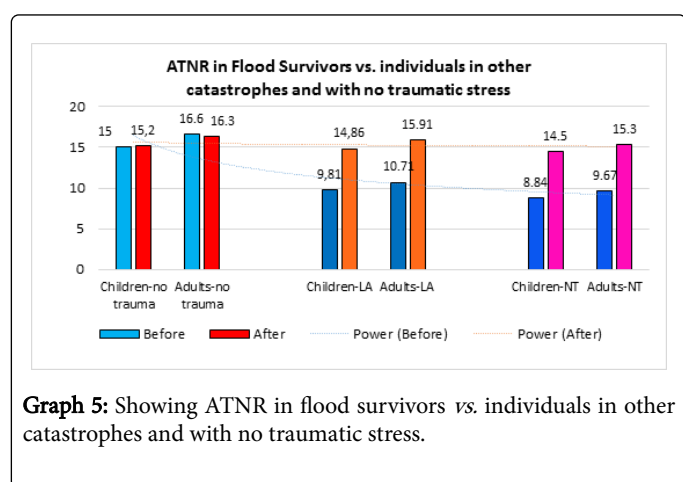
**Asymmetrical Tonic Neck Reflex (ATNR):** Specifics in flood trauma-the Assessment of the ATNR reflex pattern in the Louisiana flood survivors demonstrated that 87% had an incorrect pattern and was hyperactive, hypersensitive, and scoring at the dysfunctional level. In the group of survivors studied from Newtown, CT shooting (2013) 97% demonstrated ATNR at a dysfunctional level. This pattern was particularly hyperactive and elicited hypersensitivity of the auditory channel in Newtown survivors. The Louisiana survivors also were noted to have their ATNR to be hyperactive and demonstrated hypersensitivity. This was a surprising fact, as in the Newtown massacre sounds of the shooting were heard by everyone at school (the intercom system was on), while flood survivors did not hear any sounds and only saw the rising waters without any frightening sounds. The dysfunctional response of the ATNR triggered the Stapedial reflex (acoustic) to over work. The sensory integrative system was notifying the auditory system that something was wrong by keeping silent and

eliciting the body's alarm system. The auditory system of the LA survivors was extremely sensitive and was found to be listening too hard to find danger. When the individual had water all around, their

protection system should be led by the work of the vision and motor-postural systems, but the protective mechanisms of the body pushed the auditory system to be on alert just in case (Table 6 and Graph 5).

Reflex	ATNR in Flood Survivors vs. typical individuals and survivors in other catastrophes					
	Norm (n=1086)		Flood survivors (n=79)		Newtown survivors (n=210)	
Event	Children (n=730)	Adults (n=356)	Children (n=34)	Adults (n=45)	Children (n=134)	Adults (n=76)
Before	15 ± 0.67	16.6 ± 0.27	9.81 ± 1.32	10.71 ± 1.03	8.84 ± 0.92	9.67 ± 0.65
After	15.2	16.3	14.86 ± 0.64*	15.91 ± 0.82*	14.5 ± 0.69*	15.3 ± 0.69*
P	>0.05	>0.05	<0.05*	<0.05*	<0.05*	<0.05*

**Table 6:** The results of ATNR Reflex Assessment in individuals before and after the MNRI program.



**Graph 5:** Showing ATNR in flood survivors vs. individuals in other catastrophes and with no traumatic stress.

**Protective reflex profile of children exposed to flood traumatic stress:** The overall result of the MNRI Reflex Assessment found: 79 individuals (children-n=34; adults-n=45) exposed to the flood catastrophe showed the deep problematic condition of their protective reflexes: average 7.58 (dysfunctional level) and 10.71 points (low level); TGR 9.69 points in children and 10.82 points in adults; Hands Supporting 7.82 points in children and 9.71 points in adults, Moro 7.58 points in children and 8.78 in adults, Fear Paralysis 8.69 points in children and 9.82 in adults, and ATNR 9.81 points in children and 10.71 in adults when compared with reflex pattern assessment results in children and adults with normal functioning and that were not exposed to traumatic stress. The flood survivors displayed hyper vigilance in both their visual and auditory reflexes: on-going fears of sounds and views of water, rain, and clouds. Following the reflex integration treatments, immediate noticeable changes were noted: improved Trunk Extension reflex pattern, easier visual and auditory focusing, better binocular and singular vision, eye tracking, and smiles. Some of these survivors demonstrated the ability to step into the future and plan the next steps of life and recovery.

The participants who received the MNRI Trauma Recovery protocols during both the LA flooding tragedy and the Newtown, CT shooting gave input of how they experienced these strategies. The following responses are from participants of the LA flooding study group:

Two female adults reported that the protocol was very helpful for them. They both reported feeling different after their sessions. One told the MNRI group that she felt better able to cope and deal with the stressor of her current situation. Both asked to be notified when sessions would be offered again.

An older teen boy reported a significant decrease in his stress level after the session. His mother later reported that his reduced stress state continued after the session and that he was coping better with a more positive attitude towards the future.

**Summary and Additional Discussion:** The reflex integration assessments and work completed by the MNRI team with the children and adult survivors of the floods and of the Newtown-Sandy Hook School shootings made it clear that neurosensorimotor reflex integration made a change in protective reflex patterns. At initial assessments, 42.7% of the LA flood group and 43.3% from the Newtown shooting group [46] had scores on their reflex patterns that tested in the dysfunctional range. In MNRI, whenever more than 35% of reflex patterns are dysfunctional the diagnosis of Reflex Integration Disorder (RID) is given [53,56]. The children and adults of both the LA floods and the Sandy Hook shooting exhibited RID similar to that exhibited by children who witnessed other human catastrophes and natural disasters [41]. Clearly, with so many of their reflexes compromised, these children and adults are in a state of physical and emotional shock severe enough to negatively influence their daily function and well-being.

The loss in protective reflex patterns, specifically, Core Tendon Guard (trigger for HPA-stress-axis), Moro (fight or flight), and Fear Paralysis (freezing), ATNR (auditory reactivity), and Hands Supporting (personal space and physical body protection) indicated that these children and adults were experiencing traumatic 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, trans-marginal inhibition, and disassociation.

The MNRI Trauma Recovery Protocol brought about significant changes in the LA flood study group and in the Newtown shooting group as indicated in the above information. Improvement in reflex pattern function progressed quickly with MNRI treatment, assuring



significant and stable improvement in the children's and adult's everyday lives. These study groups also provided new discoveries on how the body can quickly adapt and make functional changes in reflex motor output when survival is tested (ATNR modifications in both study groups). The MNRI team suggests that while considerable improvements were noted in the Fear Paralysis, Moro, Core Tendon Guard, ATNR, and Hands Supporting reflexes further corrective work was still needed to ensure that the functioning of RID does not become a permanent survival response to daily stress situation. Another interesting finding from these study groups was that for the Newtown children who did not experience therapy with reflex systems until three months or longer after the tragedy, the pace of positive changes and recovery were slower. They exhibited higher levels of chronic stress, 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.

As further work continues with both study groups we hope that a full recovery of these patterns and optimal outcomes, including overall neurodevelopment healing will continue. The MNRI work in LA, and Newtown highlights the importance of an urgent need for professional facilitation of reflex integration for anyone at risk for chronic trauma or PTSD.

It has been noted that other tools besides MNRI made a big difference for the Newtown survivors, too. The outpouring of professional and non-professional care provided necessary healing, comfort, and support. Yet one important piece, from a neurosensorimotor point of view was missing from other treatment modalities: the need to address the unconscious and involuntary physiology of positive survival and protection, which are inherently built within reflex system. The more knowledge that is gained about the automatic responses of protective and survival mechanisms, the more specific information we can share on RID and specific strategies and techniques to help bring survivors of traumatic events back to a state of homeostasis and well-being. In order to affect the lower brain function and its connection with the HPA-stress-axis, effective work must be applied at the non-cortical level rather than the cortical level; 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. The MNRI work with Louisiana survivors and the survivors of the Newtown, CT shooting that used only this therapy modality affirmed that these techniques were highly beneficial.

The concepts discussed here, and the improvements noted, are not just dry statistical information. These numbers represent fallout from an unspeakably tragic event which touched us all personally, and the goal of this report is to offer a treatment modality that can lead survivors of such dark events to a non-invasive way to let go of their pain and senseless loss and move forward towards inner peace, hope, and a positive vision of the future. Early intervention of the MNRI therapy is key to promote neurosensorimotor reflex integration. More than the rising scores on assessments, our success was measured by renewed health, joy in life, deep restorative sleep, resilience, and optimism in the survivors.

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