Case Study: Development of a Child's Fine Motor Skills and Speech

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Introduction

The main challenge in therapeutic professions is finding research methods to resolve our client's problems with maximum precision and efficiency (T. Pilch, 1995). This case study describes a girl, Maja, now 5 years of age, who has a dysfunction of the central nervous system. The main hypothesis was that MNRI® therapy, which influences reflex circuits, also will improve her neurodevelopment for growth in fine motor coordination, specifically, manual motor skills and speech. (Consent of the Bioethics Committee of the Medical Academy in Wroclaw No KB – 160/2012). This research was conducted at the Wroclaw Subsidiary of the Dr. Svetlana Masgutova International Institute.

Joanna Kowalewska

A clinical observation and description of the results were conducted at the beginning and end of the research project, allowing for the creation of an individual therapeutic program for the child.

Research Techniques and Tools

The research included the following steps and procedures:

Observation, interview, research of documents, both medical and others.

To see the specific level of Maja's development, we observed her: 1) motor coordination – the quality of her movements in time and space, 2) facial expressions, and 3) communication and interaction competence.

Maja in the sandbox.

These abilities were observed in a free play situation using the following developmental criteria: a) sensorimotor abilities (how she moves and uses her senses), b) oral-facial motor abilities (oral motor control, ie. mouth open/closed or salivating/not), c) communication (who was the initiator, her vocabulary, oral-motor and oral-facial abilities and habits), d) eating and drinking (dependent/independent, the quality of the oral-motor abilities, how much and how long she chewed and swallowed, whether she choked), e) play (who initiated the play, what she played, her ability to play and relate to peers).

The interview was focused on aspects of development such as motor, sensory, emotional, cognitive, communication, and social abilities, including information about family structure.

Examination of documents from various specialists: medical, hospital abstracts, the results of the medical

examinations and opinions: psychological, pediatrician, oral specialists, and the judgment of the disability were studied.

Tests used for research were:

Kielin's Profile of Student Achievements. This profile, based on clinical observation, allowed us to score specific skills of a child in relation to her age. This profile gives a glimpse of 'student achievements' in various aspects: visual and auditory perception, upper and lower motor skills, hand-eye coordination, social skills, receptive and expressive speech, imitation, cognitive function, and self-reliance. This scale can indicate matured/strong and underdeveloped functions, and allows us to track the child's progress and changes (Kielin, 2009).

MNRI® Reflex Assessment was used for: 1) diagnosis of primary motor and reflex patterns, 2) creating an individual MNRI® program aimed at improving the neurosensorimotor system through activation of primary reflex patterns. Diagnosis of reflex integration allows a specialist to see specific disorders in the reflex circuit and establish whether the reflex pattern is coherent to the age of the individual and neurologically normal.

This Assessment presents a detailed analysis of work of sensory-motor coordination in a circuit, activity of motor reaction; intensity (muscle tone regulation), latency (duration and dynamics of reactions), and symmetry in response to stimuli, and characteristic features by the recognition of the reflexive motor reaction (Masgutova, Regner, 2009; Mass, 2007; Pilch, 1995; Sadowska, 2011).

Clinical Observation and Research

Developmental Characteristics of the Child: Maja is a child born from her mother's first pregnancy, born after 39 weeks of pregnancy by C-section. There was an indication of oligohydramnios (low amniotic fluid levels) and intrauterine growth restriction of the fetus. The physical examination at birth showed no abnormalities except for a slight decrease in muscle tension. An ultrasound in the second day of life found a second stage hemorrhage but during follow-up visits after the first and fifth months, the brain was normal in an ultrasound.

After 3 months of age the following were noted: some postural asymmetry, low tone for head righting (couldn't lift her head while lying prone), asymmetry in supporting herself in the upper extremities, and tightly clenched fists. At the fifth month the Vojta Method was recommended for rehabilitation; at the eighth month the Bobath Method was also recommended; at the 11 month the Vojta Method was discontinued for Maja because she was crying for pain from the procedure and because her muscle tension had increased greatly. Since her tenth month of life, due to microcephaly and delay in psychomotor development, she was under the permanent care of developmental specialists, including ophthalmic care due to convergent alternating strabismus and myopia, resulting in permanent prescription of eyeglasses. At 18 months of age she had her first seizure. The MRI results of the brain showed hypoxic-ischemic changes reaching deeply into the subcortical area of the parietal and frontal lobes of both hemispheres. She also had minor asymmetry visible in her ventricles. An EEG and sleeping study showed pathological changes localized in the right hemisphere as well as the frontal-temporal-center of the right side and the temporal-parietal-occipital of the left side. The sleeping test additionally showed that Maja's physiological sleep was accompanied by multiple and continuous seizures. Despite taking medication (currently Lamictal and Keppra) epileptic seizures occurred periodically and so deep in pathology that she was hospitalized several times. All the dysfunctions described influenced Maja's neuro- and cognitive development significantly. Currently Maja is under the care of many specialists.

Maja creating art.

Functional Diagnosis: An observation of Maja, then 3 years old, showed many dysfunctions before MNRI® was begun, particularly in the following areas of development:

Sensory-motor activity. Maja could physically move: sit, stand, and walk, she tried to move on her own though still she needed support when walking as her movements were unstable, ungrounded, and poorly balanced. She had poor control of lower limbs – her knees were bent; she had difficulty carrying her body weight; she had a lack of proper postural control; and appeared asymmetrical in a standing position because her gravity line was offset in relation to her body midline. She had increased muscle tension and her balance disorder caused difficulties for motor planning and control. Manual fine motor skills (clay modeling, drawing) were a real challenge for her and she was reluctant to use her hands. Muscle tone in the areas of her shoulder,

neck, head, and face were hyper and her tactile sensation in these areas was hypersensitive. Rotational movements of the spine were very limited and rigid; so when looking behind, her entire body was involved. She had hyper muscle tone in her trunk and upper limbs and low motor velocity which made her unable to properly fulfill daily visual-motor hands-on tasks.

Oral-facial motor abilities. Maja had impaired muscle tone control and tactile sensitivity. Her mouth was open, she had problems swallowing, salivated a lot, breathed mainly through her mouth, and her tongue was very tight and not mobile enough to swallow or develop articulation. Her facial expression, muscle tone control, and movements of the jaw were also very poor.

Maja using tools before MNRI®.

Language and communication. Maja's first syllables appeared at about twenty months. At that time she also learned the pointing gesture by using her index finger. She said her first words around 27 months. At the time of our study Maja could say simple sentences and her words were pronounced with great difficulty and poor coordination in her breathing. Maja's comprehension was much higher than she could express in her speech and behavior; she followed 30% of instructions. She loved to deal with words – on a visual-oral level and also by recognizing objects by pictures–her receptive vocabulary was much larger. She liked to be both a listener and an active communicator, initiating play and interaction.

Eating and drinking functions. Maja was able to drink from a cup. She could independently put food into her mouth and bite off soft foods. She required assistance when using a spoon and fork. Maja had difficulty controlling closing her mouth which resulted in poor chewing ability and difficulty keeping food in her mouth. Overall, she showed significant difficulties in coordination, control, and precision in her oral-motor abilities.

Play, comprehension. Maja was interested in objects and toys but only briefly. At the same time, she was able to initiate play and give commands. She showed a very high cognitive curiosity and enjoyed listening to stories with specific toys or personalities. Her expressive speech was delayed significantly and she was reluctant to speak. She liked attention and during play she displayed initiative but refused to do the same when requested to repeat the activity with a hands-on task.

Results of Test Procedures

Profile of student achievements according to Jack Kielin

The Jack Kielin's Student Achievement Profile was conducted for Maja in specific areas of abilities accord to scores of the scale and converted into a percentile. Her development was evaluated as follows: the average level of completed tasks for a 3 year old was 37.9% for Maja.

Fine motor abilities showed a very low level (4) - 13%, and self-reliance (11) - 18%. She obtained a high score in receptive language (7) - 83 %, but it was lower for expressive language (8) 54% which meant her development levels were disharmonious.

Maja's speech development analysis showed that her speech difficulties were caused by problems on a sensorimotor but not cognitive level. Learning to control and regulate her oral muscle tone and tongue movements were most important. The most critical task was to start repatterning her oral reflexes to increase her ability to speak.

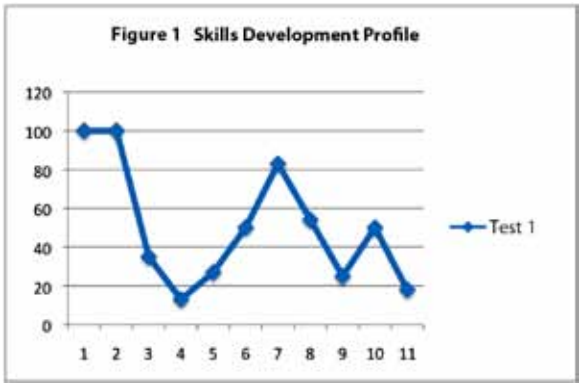

Figure 1. Maja's Profile of Achievements from Jack Kielin's Student Achievement Profile:
1) Visual perception 2) Auditory perception 3) Gross motor activity 4) Fine motor coordination 5) Hand-eye coordination 6) Social development 7) Receptive language 8) Expressive Language 9) Imitation 10) Cognitive functions 11) Autonomy

MNRI® Reflex Assessment according to Dr. S. Masgutova

Results of Maja'a Reflex Assessment showed dysfunctions in a majority of her reflex patterns, namely:

Core Tendon Guard. Maja demonstrated strong overprotection and asymmetry on the left side. This test provided information about her response to stress. The overprotective response particularly in the lower left side were blocking her ease in movements and postural control.

Hands Grasp Reflex. Maja demonstrated a tendency for delay in grasp and a preference for Phase 4 grasp as the result of poor strength in her upper limb muscles (though she had hypertonicity). She was not able to reproduce other phases of the Hands Grasp Reflex pattern. During testing she also showed compensation with Hands Pulling and Babkin Reflexes which was reflected in Maja's poor tool manipulation abilities.

Hands Pulling Reflex. The sequence of response (norm: flexion of elbows, next, head, and lastly core) was not displayed; her head righting in this test was delayed, and her core strength was very poor for flexion. Thus ,she was poor with body midline control in the whole, and her muscle tone regulation in the upper limbs was limited also for supination and pronation. This test also explained the deficits of Maja's ability for proper hand-eye coordination.

Hands Supporting Reflex (Parachute) demonstrated a hypersensitivity to sensory stimulus. The range of extension movement was limited (she attempted to use flexion instead), so the pattern couldn't fulfill its protective function (proper extension). Poor functioning of this pattern affected the gross motor skills of her upper limbs and rotation ability in her shoulder joints causing lack of freedom and rigidity in her head movements and a lack of stability.

Babkin Reflex. This reflex in Maja was pathological. When making a fist, Maja opened her mouth and at closing her mouth she demonstrated gritting of her teeth. The muscle tone in her cheek area was hypo and around temporomandibular joints (TMJ) was hyper, creating confusion in her TMJ movements and mouth closing. Due to a strong link between the oral-facial and hand-motor coordination, every attempt to speak elicited movements in her hands, and, vice versa. The dysfunctional Babkin Reflex negatively affected her hand-mouth coordination and articulation.

Asymmetrical Tonic Neck reflex (ATNR). Turning of the head to both the left and the right was causing significant shortening of Maya's lower limb on the same side of her body, which indicated her ATNR was not functioning correctly and showed a retained reactive automatism inhibiting its maturation and integration. Turning the head to the side was also causing greater muscle tone in her oral-facial and neck area. This reflex pattern was evidently affecting Maja's auditory-visual coordination leading to dysfunctions in auditory and visual processing. Her ATNR was affected also by a poor rooting reflex – in the test (of the rooting reflex) she showed an incorrect tendency to move her eyes in the opposite direction compared to her head movement, which was causing additional spatial disorientation for visual and auditory systems.

Spinal Galant and Spinal Perez Reflexes. These reflex patterns are the basis for development of the body antigravity, and also for dynamics, proper stability, and balancing. They affect the motor coordination within all frontal, sagittal, and transverse planes. These patterns in Maja were dysfunctional resulting in poor head control (her neck was sunken in her shoulders) and her gravity line was shifted forward-left from the body's axis midline. Her gait was rigid with a tendency for homolateral postural control and her pelvis was tilted too far

forward (the influence of a poor functioning Perez pattern). Her rigidity in spine rotation movements was limiting her torso from turning to the side and limiting limbs movements, involving non-productive movement for her entire body. On a functional level, dysfunctional spinal patterns were affecting her vision by limiting her perceptual field and restricting her focusing.

Plan for conducting therapy with the child

After a detailed analysis of the diagnoses of reflex patterns in Maja, a comprehensive therapeutic intervention program was created for her, which was based on a complex, multi-level approach aimed at specific areas of dysfunction. MNRI® was chosen as the main method for her. The therapy plan targeted the following areas of development: gross motor skills, tactile and proprioception, fine motor abilities, hand-eye coordination, oral-facial and respiratory system. The goals were improvement of 1) the gravity/antigravity mechanism, 2) vestibular system, 3) muscle tone regulation, 4) gross motor skills, 5) reduction of excessive sensitivity to tactile stimuli, 6) the perception of the own body parts, 7) hand grasp and manual skills, 8) coordination and movements of the upper limbs, 9) visual perception and hand-eye coordination, 10) tolerance for touch in areas of the head and face, 11) control of mouth movements (proper closing/opening), 12) oral-facial dynamics – oral-motor control, swallowing and salivation, eating, and chewing, 13) breathing (nasal instead of mouth). MNRI® programs used for realizing these tasks were: Neuro-Structural Reflex Integration, Archetype Movement Integration, Tactile Therapy, Oral-Facial and Visual-Auditory Reflexes Integration, Reflex Re-patterning, and Proprioceptive-Vestibular Reflex Integration.

Maja attended MNRI® therapy sessions once a week, lasting about 60 minutes and received a Home Program of 5 days a week from 20-40 minutes to 1½ hours a day. The work with her was organized in a two-fold way: to support of her sensory-motor abilities though reflex integration and activation of her cognitive processes.

At the beginning Maja was not cooperative. At our therapy sessions, her focus and participation was very fragmented with low motivation, and she required constant attention and reminders of instructions. Telling fairytale stories were of great help – she loved to listen to made up stories. Now she can initiate them herself choosing the objects and toys for spontaneous stories.

3.5. Results of the Therapeutic Work with Maja

An evaluation to determine changes in Maja after MNRI® was performed after 6 months was done using the same tools - Student Achievement Profile and a second MNRI® Assessment.

Maja's development was still impaired but improved significantly in all areas and on many levels. Her sensitivity to touch had changed in many parts of her body although still she had tactile defensiveness for touch on the head and upper front of the body. Her motor coordination and postural control improved especially well. She started speaking much more distinctly, building complex sentences. She also was able to control closing her mouth, salivating, and eating functions – swallowing, biting, chewing, though still not at a level of complete automatic response. She started drawings dots and circular lines. Her ability to serve and entertain herself was still problematic. Maja was still reluctant to cooperate, at the same time, she was more interested in socializing with people and initiating more interaction with therapists and others.

Maja's grasp after MNRI®.

Profile of Student Achievements Results

In the second assessment, the results were: Maja's average level of completed tasks increased to 65.4%. The best results were achieved in receptive language (7) - 100%, and expressive language (8) - 86% meaning she showed a dramatic increase in her semantic level of speech. Her speech still needed further sensory-motor support but it improved remarkably. She is more understandable and her speech was better coordinated with breathing which was longer and smoother. The weakest result was recorded in self-reliance (11) - 36%, well below the average level. Detailed results for comparison with the first assessment are presented in Figure 2.

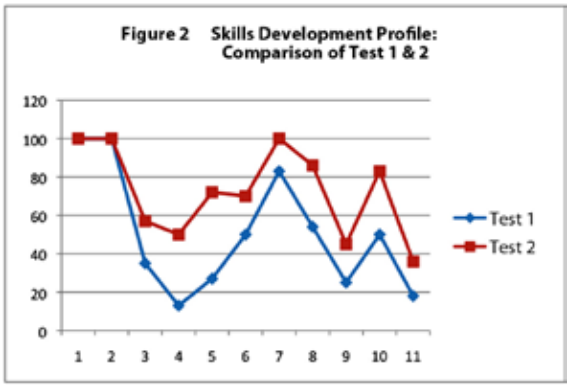

Figure 2. Profile of the Child's Achievements (Assessment 1 – blue; Assessment 2 – red) by Jack Kielin's Student Achievement Profile:
1) Visual perception 2) Auditory perception 3) Gross motor coordination and mobility 4) Fine motor coordination 5) Hand-eye coordination 6) Social development 7) Receptive language 8) Expressive Language 9) Imitation 10) Cognitive function 11) Autonomy

Comparative analysis of Assessment 1. (blue) with Assessment 2. (red); the results *yielded the following changes* for the certain scales:

Visual and auditory perception (scale 1. and 2.) evaluation shows that Maja has achieved the maximum score. The *difference* in the changes of percentages are: gross motor skills (3) - 22%, fine motor coordination (4) - 37%, hand-eye coordination (5) - 45%, social development (6) - 20%, receptive language (7) - 17%, expressive language (8) - 32%, imitation (9) - 20%, cognitive functions (10) - 33%, and autonomy (11) - 18%. The average level of performed tasks changed by 27.5%.

The biggest increase of points were for hand-eye coordination and fine manual skills. Less change was noted in autonomy.

Results of MNRI® Reflex Diagnosis

After a 6 month period of MNRI® treatment, the most significant changes in Maja's reflex patterns were:

Tendon Guard Reflex. Over-protective response improved, she was showing much better stress resilience, which was seen in better muscle tone regulation, symmetry in body, and postural control; her tendency for inclining to left side was resolved.

Hands Grasp pattern. Maja showed a significant improvement in her strength and speed of grasp. There was no longer a negative compensation from the Babkin Reflex pattern, which impacted positively her coordination between opening and closing the hands, and more efficient manipulation with objects. Maja also had begun to imitate certain phases of the Grasp Reflex pattern and manual operations.

Hands Pulling Reflex. An improvement in the sequence of the performed movements (elbow flexion-head flexion-core flexion) has happened, although the movement of the head remains slightly delayed relative to the torso. Her new ability to flex elbows for a stimuli allowed her to facilitate the coordination of the upper limbs and hand-eye links as well as the rotation of the wrist.

Hand Supporting Reflex. There was now no oversensitivity to sensory stimulus. The direction and range of her movement had become correct. There was significant improvement in muscle strength, still, timing was slightly delayed. Propping up was performed automatically, the increase of range of motion in the shoulder joints is now good.

Babkin Reflex. In this pattern Maja moved from pathology to a higher level - dysfunctional, which was a very fast progress in such a short length time (6 months). Still she demonstrated hypersensitivity and hyperactivity in the area of the TMJ (temporomandibular joints) with no previous pathology. Her pathological link between hands activation and eliciting the mouth responses was resolved, which allowed her to regulate better her mouth-motor abilities, eating, and speech.

Asymmetric Tonic Neck Reflex (ATNR). A needed decrease in hypersensitivity and hyperactivity of this pattern has happened, resulting in better ear-hand-eye coordination, and her ability to listen more attentively and comprehend increased.

Spinal Perez and Galant Reflexes. Maja's line of gravity returned to overlap with her midline of the body, resulting in her posture becoming more upright. Her gait has become more grounded, stable, coordinated; the swaying movements of her pelvis are now correct, more flexible, and dynamic. There was improvement in head righting and control.

Conclusion

To effectively support children with developmental disorders, it is important to look at a child as a whole and to be aware that disorders in one area often result in developmental problems in a different area (Luria), sometimes seemingly areas not connected with each other. When planning therapy, one needs to keep in mind that the sensory and motor systems are closely linked and yet are interdependent of each other (Masgutova, 2005; V.S. Mass, 2007; L. Sadowska, 2011). The MNRI® method gives therapeutic techniques that take into account these facts.

Based on the case study results and its analyses, the achieved results allow us to conclude that:

- an improvement in processing of sensory information effects an improvement in motor functions
- improvement in sensorimotor processing achieved through MNRI® positively affected the manual abilities and articulation, as well as, the overall neurodevelopment of a child.

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I congratulate Maja and her parents for their step-by-step positive changes, for their enthusiasm, amazing care, and for the impact of all that was done to secure Maja's bright future! – Joanna Kowalewska

