

# An Autistic Spectrum Disorder (ASD) Level 3 nonverbal 4 year old, with learning difficulties starts conversations in 4 weeks: A case report

---

Genevieve Dharamaraj

---

**Narrative:** This case report describes ASD Level 3 nonverbal boy undergoing a novel Melillo Method™ therapy and looking at retained primitive reflexes as a measure of developmental delay. Retained primitive reflexes are the most basic stage of motor development, and knowledge of this motor-language relationship could provide insights into nonverbal autism.

The main symptoms presented were delayed speech, sleeping issues, emotional regulation with behaviour, and sensory issues. Clinical examination revealed many retained primitive reflexes, with many postural reflexes still present as well as a deficiency in core stability, vestibulo-ocular systems and cognition.

Intervention included a 12 program including the use of Photobiomodulation (low level laser), Rezzimax therapy (sensory motor input with vibration), Neurosage (digital therapy utilising color, sound and vibration), and coactivation with the use of coloured glasses (light) and essential oils to stimulate the olfactory system. This program is centre-based and aims to integrate sensory input and strengthen motor skills through regular frequency and duration of multimodal approach, as well as home-based exercises to integrate primitive reflexes.

In the 12 week period the subject became able to have meaningful conversations, decreased his aggressive meltdowns, had consistent eye contact and was more coordinated with crossing the midline. These are all skills not previously demonstrated, as stated by his mum and feedback from his other therapists, once they restarted care.

The changes seen in this child over 12 weeks are numerous, and the examination revealed a decrease in the strength with the Retained Primitive Reflexes. Retained Primitive Reflexes are the most basic stage of motor development and knowledge of this motor-language relationship could provide insights into non-verbal Autism.

**Indexing Terms:** Chiropractic; Functional Neurology; Autism Spectrum Disorder; Melillo Method™; adaptability; well-being; brain potential.

## Introduction

**A**utism Spectrum Disorder (ASD) is a major Childhood Neurological Disorder, currently impacting 1 in 70 people in Australia as reported by the *Australian Bureau of Statistics* in July 2018. Children with ASD demonstrate impediments in the performance of skilled movements and gestures. Many investigators have referred to delays in maturation of motor function during the early years of development which may lead to dysfunctions characteristic of ASD. (Melillo, 2022)

...this report provides a detailed description of a range of therapeutic approaches used for a Level 3 non-verbal boy which led to significant positive changes in his adaptability and well-being'

ASD is a complicated syndrome characterised clinically by language impairment, dysfunction in social engagement, stereotypical movements and behaviours, and various cognitive deficits. Robert Melillo (Melillo et al, 2022) mentioned that the presence of Retained Primitive Reflexes (RPR) is a common feature of children with ASD. There is no visible damage, injury, lesion or degeneration as a basis of hypothesising that RPRs reflect a maturational delay of brain areas that would typically inhibit these reflexes, especially those in feedback with the frontal lobe.



'Unevenness' of cognitive function seems to be a significant feature of ASD. It is proposed that functional dis-connectivity may be related to functional asymmetry within cortical networks with increased or decrease coherence within networks. (Melillo, 2022)

Traditional approaches including occupational therapy, physical therapy, special education services and Applied Behavioural Analysis (ABA) are generally directed at managing symptoms and compensating for disabilities. These approaches rarely look at the developmental trajectory from bottom up, looking for any deviation of normal neurological development.

### The patient

The patient is a 4y boy with a diagnosis of *Autism Spectrum Disorder Level 3* according to the DSM V , as well a generalised global delay diagnosed by his paediatrician.

- ▶ Primary concerns included delayed speech, diagnosed as non-verbal by his paediatrician. He was completely non verbal until 3.5 years, and now can say 50 words but no sentences.

The patient is prone to aggressive meltdowns and at times will hit and bite.

The paediatrician noted that he has difficulties with attention and emotional regulation which impact on his day-to-day ability to engage, learn and interact.

The patient has significant disrupted sleep routine which has been difficult to manage despite supportive behavioural therapies and the use of *melatonin* 6mg as prescribed by his paediatrician.

- ▶ Pregnancy/Birth: Mum had gestational diabetes during pregnancy. Birth was emergency C-Section with the cord wrapped around his neck.
- ▶ Diet: he was breastfed for 14mo and started solids at 6mo.

The patient had eczema, asthma, allergies and ear infections and was frequently prescribed antibiotics.

- ▶ Milestones: he started to walk at 13 months
- ▶ Mum thought he was deaf as he didn't respond to loud noises.
- ▶ Completely non verbal until 3.5 years when he started saying words.

He is within a stable family; parents are happily married. Genetic familial history include depression and diabetes on both sides.

Previous therapy included Speech therapy and mum noted some slight improvements, but nothing with speech.

### Clinical Findings

*'Primitive Reflexes are adaptive reactions in the neonate and diminish as the brain and nervous system mature. Frequency of the retained Primitive Reflexes is varied and there exist disagreement about pathological impact and significance' (23)*

## *Reflex Testing*

Standard and accepted tests and scoring method of testing is based on the percentage of retained Primitive Reflexes (RPR). Here, 0 is a non-retained reflex and 4 is 100% of retained reflex. Tests developed by Sally Goddard-Blythe in 1996 at the institute of Neurophysiology Psychology in the UK were to assess the prevalence of primitive reflexes in children. (2)

**Table 1:** Retained Primitive Reflexes Results

	29/4/2022	1/6/2022	29/6/2022	3/8/2022
Moro	+2	+1	+1	+1
Babinski	R+2, L+ 3	+2 B/L	R+3, L+1	R+1, L+2
Spinal Galant	R+1,L+2	R+3,L+2	R+1, L+2	R+2, L+1
Rooting Reflex	+3 B/L	+3 B/L	+2B/L	R+1L+2
ATNR	R+2,L+3	R +1, L+2	+1B/L	R+1, L0
Palmar	R+2,L+3	R+2.L+3	+2 B/L	R+2.L+1

## *Melillo™ Neurobehavioral Hemispheric Checklist Scores*

Melillo's checklist has been designed to help identify hemispheric weakness with separate categories including Motor, Sensory, Emotional, Behavioural, Academic, Immune and Autonomic as a general indication of hemispheric delays in development. The checklist consists of two hundred characteristics of a brain imbalance, and is used as a screening questionnaire and not as a diagnostic tool. The examination findings are truer indicator of brain weaknesses.

The subject had the following indications

**Table 2:** Hemispheric Checklist

	Left Brain	Right Brain
Motor	4	7
Sensory	4	11
Emotional	0	7
Behavioral	5	15
Academic	20	5
Immune	3	5
Auto	1	3
Score	37	53

## *Other Examination Findings*

**Table 3:** Examination Findings

- The Optokinetic Reflex showed Latency to the right and down indicating the motion detection system with decreased activation of the right hemisphere. (26)
- The Smooth pursuit showed latency to the right indicating parietal-occipital gaze centre via cerebellar and vestibular pathways. (26)

- For smell there was no recognition to the common smell of peppermint, or reaction to noxious stimuli. This indicates decreased activation of ipsilateral temporal lobe.
- The oxygen Saturation on the R) was 97% and L), 96%. This is taken as within normal limits
- The pulse rate was R) 111 and L) 103, which is within normal range however with the polyvagal theory proposed by Stephen Porges this suggests activation of the myelinated vagal system occurring ipsilaterally.
- The post rotational or nystagmus test took 3 spin cycles to the R) to induce normal rate of nystagmus of 12-14s. It also took 3 cycles to the left. An under-active side indicates the under-active hemisphere. (26)

### Clinical impressions

Generalized Global Delay: many milestones in normal development were not achieved, and many characteristics were positive on the hemispheric check list.

Right Hemisphere weakness: Categorised by hemispheric checklist, the strength in retained primitive reflexes particularly with Babinski.

Right Parietal weakness: there is limited ability to balance and the child could not walk across the balance beam on his own.

Right Orbital Frontal Cortex weakness : lack of eye contact, inability to socialise and no recognition of smell.

Left Cerebellum weakness: falls to the left on any cerebellar testing. Subject was unable to perform *Fukuda*, or other cerebellum testing due to limitations in understanding instructions.

### Therapeutic Intervention

The intent of each therapeutic intervention was for its application to produce a specific stimulation. Various therapies were applied at each twice-weekly session over 12w.

NeuroSage involved low impact games primarily focused in generating upward head and eye focus with patterned eye movements on a TV screen with Xbox controller for fine motor movements. These included '*Tunnel*', '*Roll A Ball Game*', and the '*Trash Dash Game*'.

The R) Visual Field accessed the Dorsolateral Prefrontal Cortex for the Vestibular system, Balance, and Lateral mobility. Specific eye movements to stimulate the right hemisphere.

For the R) Orbital Frontal Cortex we used vertical and horizontal eye movements, fixation, pursuits, saccades, go-no go, and colours as blues and greens. (14)

Auditory stimulation used headsets with music in the left ear with specific frequencies for right hemisphere stimulation for Temporal lobes, Parietal, Hippocampus, and Frontal stimulus. (14)

The Vibe Plate with various frequencies stimulated mechanoreceptors with frequencies from 10Hz - 40Hz and in progression suited to the patient's tolerance. Balance and Coordination are addressed at 10Hz in the Cerebellum. Cortical Stimulation at 40Hz stimulated Temporal Binding.

Blue Glasses addressed the Right Brain to increase parasympathetic responses and stimulate right hemisphere. (14)

Peppermint Oil provided olfactory stimulus via chemoreceptors and was applied on right collar for ipsilateral stimulation of olfactory system, using the Limbic system and the primitive nose brain association. (14)

Rezzimax, a hand-held, FDA approved, vibrational device applied vibration on left side of body to stimulate the left cerebellum.

Photobiomodulation, from a low level laser device by *Neurosolutions*, allowed specific frequencies to be programmed to stimulate the R) Frontal Cortex, R) Parietal-temporal-occipital lobe, and L) Cerebellum.

### *Gut microbiome*

This is a major hub during development. We note that infrared at 808nm provides photobiomodulation with a positive influence on microbiome of the gut.

We applied Primitive Reflex Intensives as 3 sessions over 12w. Photobiomodulation was applied over the Rhombocephalon spot for the Cerebellum, Pons and Medulla.

We also used:

- ▶ Olfactory as Lavender on the L) collar
- ▶ Red Glasses
- ▶ Photobiomodulation
- ▶ Peppermint spray on ant  $\frac{2}{3}$  tongue for the R) Cerebellum and L) Ipsilateral temporal lobe. (14)

We stimulate the L) hemisphere (Broca's area) while using the International Phonetic Alphabet with words 'Spy, Baby, Man ...' and activated nuclei of the *Facial n.* on the pons which is the same area for the rooting reflex.

### **Follow Up and Outcomes**

The patient moved from delayed speaking and using only about 50 words and not a single 3 word sentence to where he can now maintain conversations.

The patient has complete eye contact in his language trajectory and has increased language development by a total of 10mo; at initial he was at the level of an 8mo old and by the end of the 12w therapeutic period was at the developmental age of 48mo.

Has cognition shifted from where he could barely understand instructions to where he now understands nearly all instructions with commands of more than 3 consecutively. At 2y a child should understand simple instructions. At the conclusion of 12 weeks, this child could follow 3 step commands with is developmentally the stage of a 4y old.

His gross motor skills are now at where he is able to kick and punch and is fully coordinated. At age 3, a child should be riding a tricycle and age 4, riding a bike.

Socially he was ok to play next to kids in parallel play but pushed kids if they come too close, now he is engaging and trying to play with other kids and is able to play with his brother

He shifted from no sense of smell recognition and eating only bland foods to where he can recognise smell and is interested in tasting new foods.

Of benefit to his parents is b Behavioural tantrums have decreased and almost gone away completely, reflecting the Pre Frontal Cortex stimulation for self regulation

### **Discussion**

The subject was diagnosed with ASD Level 3 according to his Paediatrician under the DSM-5 criteria. According to Kadam et al (11) the stability after 18-30mo of initial diagnosis of ASD based on DSM-5 in children < 5 years was 80%. All children continued to have developmental difficulties in mainly domain of language, attention, or social communication. Approximately 30-40% of children with ASD remain minimally verbal into adulthood. (18)

Our patient's paediatrician stated in a report 15<sup>th</sup> August 2019 '*subject has very severe delays in language and learning. He will need very intensive intervention across domains to develop his skills*'.

An audiology report from 12<sup>th</sup> April 2017 revealed hearing within normal limits for both ears. Therapy included conventional Occupational Therapy, and Exercise Physiologist, and a Speech Pathologist, all reporting minimal changes. The parents decided to cease all other therapies whilst engaging in the 12 weeks of Melillo Method™-based care with the Chiropractor.

In normal language development, a 2-year-old would have 2 to 3-word sentences with a 200-300 word vocabulary. Our subject at 4y had only 50 words and no sentence structure. At the conclusion of 12w our subject was speaking in 4 or 5 sentences and beyond, and was able to engage in full conversations. These may be greater than age-appropriate language skills.

### *Primitive reflexes*

Primitive reflexes (PRs) are muscle reactions that occur automatically to specific stimuli and are critical for the survival of the newborn infant. As the nervous system matures, they are gradually inhibited and superseded by postural reflexes. If they are retained beyond normal development, they have the potential to disrupt maturational processes, and interfere with subsequent development. (25)

The persistence of these reflexes is hypothesised to reflect a maturational delay of areas of the brain, in particular the frontal cortex that would normally inhibit these reflexes. The presence of these reflexes is a common feature of children with neurodevelopmental disorders such as ADHD and Autism. (23) Retained reflexes play a role in the brain's ability and efficiency in processing sensory information (6, 7) Melillo hypothesises that RPRs in ASD are in part associated with maturational delays and imbalances and are not necessarily a result of actual structural damage or pathology. (Melillo, 2022)

Studies are finding a relationship between speech and language development that is impaired and retained primitive reflexes. The ATNR should be inhibited by the fourth and sixth month of life, and if retained, not only affects the function of the cerebellum through head control, but also speech functions by making it difficult to insert hands and objects into the mouth when the head is turned.

### *Moro reflex*

A persistent ATNR creates difficulties with tactile self-stimulation of the oral area. The Moro reflex should be inhibited by the fourth and sixth month, and if retained, it can cause difficulties in the development of the acoustic stapedius reflex which protects the ears from loud sounds. It consists of contraction of the stapedius muscle in response to loud noise. Auditory processing and speech may be impacted. A retained Moro can create mouth breathing, and cause habitual open lips, low and forward tongue posture and a decrease in muscle tone which could impact articulation. The spinal galant reflex should be inhibited by the third to ninth month. In the womb, sound vibrations stimulate the skin, and the galant reflex helps transmit vibration from the skin to the ears through a combination of skin and bone conduction. A study of 90 children with developmental language disorder showed that persistent PRs were higher than controls. (19) This study only looked at the Moro, TLR, SG, STNR and ATNR. The retained rooting, palmar, or Babinski were not included.

Neurobehavioral disorders with its symptom variation may be related to the asymmetrical maturational differences in the right and left hemispheres. Asymmetrical persistent PRs could possibly be an early marker related to this maturational imbalance. (23) Gunturkun (2017) states that there are almost no disorders of the human brain that are not brain asymmetries.

### *Nonverbal communication deficits*

In a recent report (Leisman, 2022) it is proposed that many of those with ASD have significantly more severe nonverbal communication deficits related to underdevelopment of the

right hemisphere. The reason suggested is that significant developmental delay of the right parietal lobe and insular cortex impacts the ability of interoception and body spatial awareness. The need for speech is hampered by not being able to feel their own body,

Lazarou et al (2009) in a study with 14 autistic boys, reported that EEG revealed a 'hyporeactivity' in the right hemisphere and a 'hyperreactivity' of a likely compensatory nature in the left hemisphere. In an QEEG study by Machado et al (2013) with 11 autistic children, it was postulated a failure of visual-auditory sensory integration in the right hemisphere may be a factor in Autism. Physically smaller areas of activation have been found in children with neuro-behavioural disorders. These represent regions that are delayed in development rather than any specific damage, and in autism, the reduced size and coherence as well as connectivity is attributed to a weaker right hemisphere. (21)

A study including 2,175 subjects utilising a 12w program including primitive reflex integration exercises, and hemispheric specific stimulation, demonstrated a reduction in primitive reflexes were highly associated with increased performance on mathematical problem solving and listening comprehension. (4) Another study with 10,620 participants enrolled in *Brain Balance* programs around the States, showed significant overall performance on specific tests of memory reasoning, verbal ability and concentration, The training program included exercises targeting primitive and postural reflexes, vestibular exercises and sensory stimulation. (10) This 12w program and home exercise program for our case report is very similar, however our report had greater stimulation with the use of digital therapy as well as photobiomodulation.

Recent studies demonstrated that the benefit of somatosensory stimulus is only seen when applied specifically to the hemisphere that is dysfunctional. The increases stimulation could have the effect of increasing temporal oscillations within the thalamocortical pathways, reestablishes cognitive binding between the two hemispheres. (21) Wang et al (2014) postulate that developmental disorder could be reset by stimulation or restoring a circuit's function. (28) Modulating the frequency of the stimulus using blue light for the right hemisphere or red light for the left hemisphere can change the firing rate of the thalamus and the brain. Olfactory stimulation affects the limbic structure like the amygdala and hypothalamus which regulate emotional and autonomic responses which are inhibited by frontal-cortical activity. In particular, the use of peppermint has shown improvement in cognitive function of children. (22) For this case study, we have utilised sensory input to the left cerebellum using the *Vibeplate* and *Rezzimax*.

The olfactory stimulation is peppermint on the right collar as well visual stimulation with the use of blue glasses is for activation of the right hemisphere.

### *Sensory integration*

Children with autism generally present with sensory integration dysfunction. Some will have decreased responses to sensory stimuli and yet others with have increased sensitivity to the same stimuli. The cerebellum and the cerebral cortex have two halves that must balance in activation. The child may be more sensitive to stimuli that affects the dysfunctional half of the cerebellum. Tactile, proprioception, extra-ocular and vestibular input will create over-firing of the cerebellum resulting in lower threshold to touch, movement of head, neck or body and will experience motion sickness, disordered eye movement of visual perceptual disturbances. (14)

Photobiomodulation describes the use of red or near infrared light to stimulate, heal, regenerate and protect tissue that has either been injured, is degenerating or else at the risk of dying. It is a non-invasive technique that utilises light energy with various targeted wavelengths to activate cellular activity and brain waves

The mechanism of action of photobiomodulation centres around *Cytochrome C oxidase* (CCO) which is responsible for the final reduction of oxygen to water using electrons from glucose

metabolism. The theory proposes that *Nitric Oxide* especially in hypoxic or damaged cells may inhibit CCO enzyme activity. Photon of light in red (600-700nm) and near infra-red (760-940nm) can dissociate *Nitric Oxide*, increasing mitochondrial membrane potential, increasing oxygen consumption, creating increase in glucose metabolism and increase ATP produced by the mitochondria. The NO that is released acts as a vasodilator as well as a dilator of lymphatic flow. (9)

Systemic Neural Adaptation (SNA Neurosage) system leverages a multi-modal sensory stimulus environment. It utilises visual, auditory, proprioception, mechanoreception and vestibular inputs. It was designed with hemispheric approach with considered eye movement in the games combined with specific frequencies of sound and light to stimulate either the right or left hemisphere. The Vibe plate is designed to vibrate at 10-40Hz for sensory motor into the brain in a series of increased activation as balance skills improved.

In a systemic review, it was concluded that photic and auditory stimuli seems to be a non-invasive method to induce specific mental states. (5)

The *Rezzimax* turner is a FDA approved resonance tool with various frequencies of vibration that provides sensory motor input to the cerebellum at 8-12Hz.

In an innovative and novel approach, the integration of primitive reflexes via a multi-modal approach, over the 12w has increased the developmental stages of a nonverbal child in many ways that is beyond normal progression. More research is required to determine the possibilities as a new approach to a major growing issue in Childhood Neurological Disorders.

### Limitation

The limitation of this report is that whilst a case can only describe an extended scope of practice in one particular patient, it is not generalisable to a wider population. Thus additional study is required to identify, gather, and report similar responses to specific interventions. I feel there needs to be an expansive multifactorial testing of numerous cognition functions and language fundamentals. The evaluation of primitive reflexes could have a probability of errors in its measurements.

### Conclusion

This report presented an innovative and novel approach to the management of level 3 ASD client using Melillo Method™. Therapy provided over 12w produced results beyond normal progression.

More research is required to investigate the changes noted in this report and whether changes occur with other practitioners and with similar clients.

Genevieve Dharamaraj

BSc, MChiropr, MChiropr(Paed), FIBFN-CND

Private practice of chiropractic

Cannon Hill, QLD

<https://www.nurturingbrainpotential.com.au/>

---

Cite: Dharamaraj G. An Autistic Spectrum Disorder (ASD) Level 3 nonverbal 4 year old, with learning difficulties starts conversations in 4 weeks: A case report *Asia-Pac Chiropr J.* 2023;4.2. URL [apcj.net/papers-issue-4-2/#DharamarajASD](https://www.apcj.net/papers-issue-4-2/#DharamarajASD).



## Bibliography

1. Beck RW, Carrick F, Holmes MD. Functional Neurology for Practitioners of Manual Medicine: Elsevier Health Sciences; 2011.
2. Blythe SG, Beuret LJ, Blythe P, -Nowinski VS. Attention, Balance and Coordination: The A.B.C. of Learning Success: Wiley; 2017.
3. Chan AS, Lee TL, Hamblin MR, Cheung MC. Photoneuromodulation makes a difficult cognitive task less arduous. *Sci Rep*. 2021;11(1):13688.
4. Chinello A, Di Gangi V, Valenza E. Persistent primary reflexes affect motor acts: Potential implications for autism spectrum disorder. *Res Dev Disabil*. 2018; 83:287-95.
5. Da Silva VF, Ribeiro AP, Dos Santos VA, Nardi AE, King ALS, Calomeni MR. Stimulation by Light and Sound: Therapeutics Effects in Humans. Systematic Review. *Clin Pract Epidemiol Ment Health*. 2015; 11:150-4.
6. Dr A, Dr F, Dr F, Bilbilaj DS. Measuring Primitive Reflexes in Children with Learning Disorders. *European Journal of Multidisciplinary Studies*. 2017;2(5):285-98.
7. Gieysztor EZ, Choińska AM, Paprocka-Borowicz M. Persistence of primitive reflexes and associated motor problems in healthy preschool children. *Arch Med Sci*. 2018;14(1):167-73.
8. Güntürkün O, Ocklenburg S. Ontogenesis of Lateralization. *Neuron*. 2017;94(2):249-63.
9. Hamblin MR. Shining light on the head: Photobiomodulation for brain disorders. *BBA Clin*. 2016; 6:113-24.
10. Jackson R, Wild C. Effect of the Brain Balance Program® on Cognitive Performance in Children and Adolescents with Developmental and Attentional Issues. *Journal of Advances in Medicine and Medical Research*. 2021:27-41.
11. Kadam A, Patni B, Pandit A, Patole S. Stability of the Initial Diagnosis of Autism Spectrum Disorder by DSM-5 in Children: A Short-Term Follow-Up Study. *Journal of Tropical Pediatrics*. 2021;67(1): fmaa104.
12. Lazarev VV, Pontes A, Mitrofanov AA, deAzevedo LC. Interhemispheric asymmetry in EEG photic driving coherence in childhood autism. *Clinical Neurophysiology*. 2010;121(2):145-52.
13. Leisman G, Machado C, Machado Y, Chinchilla-Acosta M. Effects of Low-Level Laser Therapy in Autism Spectrum Disorder. *Adv Exp Med Biol*. 2018; 1116:111-30.
14. Leisman G, Melillo R. Cognitive Rehabilitation in Developmental Disabilities. 2015. p. 1-58.
15. Leisman G, Mualem R, Machado C. The Integration of the Neurosciences, Child Public Health, and Education Practice: Hemisphere-Specific Remediation Strategies as a Discipline Partnered Rehabilitation Tool in ADD/ADHD. *Frontiers in public health*. 2013; 1:22.
16. Li T, Xue CX, Wang P, Li Y, Wu L. Photon penetration depth in human brain for light stimulation and treatment: A realistic Monte Carlo simulation study. *Journal of Innovative Optical Health Sciences*. 2017;10:1743002.
17. Machado C, Estévez M, Leisman G, Melillo R, Rodríguez R, DeFina P, et al. QEEG spectral and coherence assessment of autistic children in three different experimental conditions. *J Autism Dev Disord*. 2015;45(2):406-24.
18. Matsuzaki J, Kuschner ES, Blaskey L, Bloy L, Kim M, Ku M, et al. Abnormal auditory mismatch fields are associated with communication impairment in both verbal and minimally verbal/nonverbal children who have autism spectrum disorder. *Autism Res*. 2019;12(8):1225-35.
19. Matuszkiewicz M, Gałkowski T. Developmental Language Disorder and Uninhibited Primitive Reflexes in Young Children. *Journal of Speech, Language, and Hearing Research*. 2021;64(3):935-48.
20. Melillo R, Leisman G, Mualem R, Ornai A, Carmeli E. Persistent Childhood Primitive Reflex Reduction Effects on Cognitive, Sensorimotor, and Academic Performance in ADHD. *Frontiers in Public Health*. 2020;8(684).
21. Melillo R, Leisman G. Autistic spectrum disorders as functional disconnection syndrome. *Rev Neurosci*. 2009;20(2):111-31.
22. Melillo R, Leisman G. Neurobehavioral Disorders of Childhood: An Evolutionary Perspective 2004.
23. Melillo R. Primitive Reflexes and their relationship to Delayed Cortical Maturation, Under Connectivity and Functional Disconnection in Childhood Neurobehavioral Disorders. *Functional Neurology, Rehabilitation, and Ergonomics*. 2011;1(2):279-314.
24. Melillo, 2022.
25. Pecuch A, Gieysztor E, Telenga M, Wolańska E, Kowal M, Paprocka-Borowicz M. Primitive Reflex Activity in Relation to the Sensory Profile in Healthy Preschool Children. *Int J Environ Res Public Health*. 2020;17(21):8210.
26. Rashikj Canevska O, Mihajlovska M. Persistence of primitive reflexes and associated problems in children. *Годишен зборник на Филозофскиот факултет/The Annual of the Faculty of Philosophy in Skopje*. 2019; 72:513-22.
27. Salehpour F, Mahmoudi J, Kamari F, Sadigh-Eteghad S, Rasta SH, Hamblin MR. Brain Photobiomodulation Therapy: A Narrative Review. *Mol Neurobiol*. 2018;55(8):6601-36.
28. Wang SSH, Kloth AD, Badura A. The cerebellum, sensitive periods, and autism. *Neuron*. 2014;83(3):518-32.