REVIEW ARTICLE

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НЕЙРОДАМУ БҰЗЫЛЫСТАРЫНЫҢ ДАМУ ТРАЕКТОРИЯСЫНА ЕРТЕ АНЫҚТАУ ЖӘНЕ ЕРТЕ АРАЛАСУДЫҢ МАҢЫЗДЫЛЫҒЫ: ПСИХОМОТОРЛЫҚ КӨЗҚАРАС

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Түйіндеме

Бұл мақала нәресте дамуы мен пластикасына қатысты білімнің ағымдағы жай-күйін қысқаша ұсынады және объективті түрде көрсетеді. Даму траекториясының тұжырымдамасы және ерте араласудың маңыздылығы ерте анықтау және сәйкес құралдар қажеттілігі контекстінде талқыланады. Әрі қарай психомоторлы терапия, оның тарихы мен сипаттамалары сипатталады. Психомоторлы терапевттер дамудың атиптік траекторияларын ерте анықтауда және физикалық сипаттамаларға негізделген ерте араласуда шешуші рөл атқарады. Психомоторлы функцияларды құрылымдайтын сенсомоторлы және тоник тәжірибелерін пайдалану арқылы олар нормадан ауытқуларды шектеуге, бұзылулардың жиілігін азайтуға және қатар жүретін аурулардың алдын алуға көмектеседі. Балалардың шамамен 8% -ында жүйке дамуының бұзылуы бар екенін ескерсек, бұл алдын алу және қолдау үшін маңызды мәселе. Осы мақсатқа жету үшін балалардағы осы проблемаларды анықтауда мүдделі тараптардың хабардарлығын арттыру және оқыту өте маңызды.

Түйін сөздер: нейродаму, ерте анықтау, стимуляция, психомоторлық дағдылар, пластика

ВАЖНОСТЬ РАННЕГО ВЫЯВЛЕНИЯ И РАННЕГО ВМЕШАТЕЛЬСТВА В ТРАЕКТОРИЮ РАЗВИТИЯ НАРУШЕНИЙ НЕЙРОРАЗВИТИЯ: ПСИХОМОТОРНЫЙ ПОДХОД

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Резюме

В данной статье кратко представлено и объективно отражено современное состояние знаний о развитии и пластичности младенцев. Концепция траекторий развития и важность раннего вмешательства рассматриваются в контексте необходимости раннего выявления и соответствующих инструментов. Далее описывается психомоторная терапия, её история и особенности. Психомоторные терапевты играют важную роль в раннем выявлении атипичных траекторий развития и раннем вмешательстве, основанном на телесных особенностях. Используя сенсомоторный и тонический опыт, структурирующий психомоторные функции, они помогают ограничить отклонения от нормы, уменьшая количество нарушений и предотвращая коморбидность. Учитывая, что почти 8% детей имеют нарушения нейроразвития, это важный вопрос профилактики и поддержки. Для достижения этой цели повышение осведомлённости и обучение заинтересованных сторон выявлению этих проблем у детей представляется крайне важным.

Ключевые слова: нейроразвитие, раннее выявление, стимуляция, психомоторные навыки, пластичность

THE IMPORTANCE OF EARLY DETECTION AND EARLY INTERVENTION IN THE DEVELOPMENTAL TRAJECTORY OF NEURODEVELOPMENTAL DISORDERS: A PSYCHOMOTOR APPROACH

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Abstract

This paper summarises the main points of the current state of knowledge on the development and plasticity of babies. The concept of developmental trajectories and the importance of early intervention are put into perspective with the need for early detection and the associated tools. Secondly, psychomotor therapy, its history and its identity are described. Psychomotor therapists play a role in the early detection of atypical developmental trajectories and early intervention based on the body. By drawing on sensorimotor and tonic experiences that structure psychomotor functions, they help to limit deviations from the norm by reducing disorders and avoiding comorbidities. With nearly 8% of children presenting with neurodevelopmental disorders, this is an important issue in terms of prevention and support. To achieve this, raising awareness and training stakeholders in identifying these issues in children seems essential.

Key words: Neurodevelopment-early detection-stimulation-psychomotor skills-plasticity

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Introduction

Early detection in order to provide early treatment for neurodevelopmental disorders is a major current issue. Early intervention can change the developmental trajectory of children. This article aims to highlight the importance of early detection and treatment from a psychomotor perspective. Psychomotor therapy is a holistic approach that allows for accurate assessment of development. Through careful observation, it allows for the early signs of developmental delays to be objectively identified so that an appropriate intervention programme can be put in place. This article aims to review current knowledge on psychomotor development, neurodevelopment and the role of early intervention. Next, by presenting psychomotor therapy and its history, we will attempt to demonstrate the relevance of the psychomotor approach in supporting young children.

Development, developmental trajectory and neurodevelopment

Neuroscience views learning as a cerebral process in response to a stimulus, combining perception, processing and integration of information. This process leads to the acquisition of knowledge and results in a persistent, measurable and specific change in behaviour (Shaffer et al., 2009). Learning is therefore the result of the integration of all perceived and processed information , which manifests itself in structural changes within the brain (OECD, 2007). (Restrepo and Venet, 2022, p. 24) [1].

Very early in embryogenesis, movement possibilities evolve thanks to the maturation of two major systems: the cortical system and the subcortical system, each with its own role and maturation clock. This is important because, from the very first movements, neural circuits are refined and initial experiences are created in a dynamic process of interaction with the uterine environment.

From this point on, development can begin, but not just any old how! This is linked to the laws of maturation that govern these phenomena, such as the proximo-distal laws[1] and cephalo-caudal laws[2] . Here we note the importance of myelination[3] and, above all, synaptogenesis[4] . It is at this level that the environment, connectivity and learning situations take on their full meaning during this sensitive period, which is dependent on many factors. Piaget talks about sensorimotor skills, which reflect the early, mainly sensory, abilities of babies. Children develop through their motor, tactile and gestural experiences.

However, before it can be represented, the body must be experienced; hence the importance of experiences, discoveries and exploration.

Learning takes place and is possible throughout life through remodelling and the brain's capacity for plasticity. It should be noted that the frontal and prefrontal lobes mature last and play a predominant role in the abilities of anticipation, planning and regulation.

[1] The proximo-distal law concerns the development of the periphery (limb tone): The muscles of the limbs come under voluntary control earlier the closer they are to the body's axis.
[2] The cephalocaudal law concerns the development of axial tone: the muscles of the axis come under voluntary control earlier the closer they are to the central nervous system.
[3] Lipid and peptide sheath surrounding the axon and serving to accelerate the speed of nerve signal conduction
[4] Formation of synapses (connections between neurons) which are enriched throughout life under the influence of experiences and learning situations.

Numerous studies have shown that neural networks are not immutable. The environment, and therefore education and teaching methods, can modify and shape the structure of the brain. Neural networks are selected in order to refine and promote what will be useful. A selection of afferents is essential because it is necessary to know, neglect, filter and inhibit. There is therefore a need to understand how children who seem different function and, above all, whether this is correlated with particularities in brain functioning.

Neurodevelopment is a dynamic process that occurs through a series of successive but sometimes intertwined stages. The developmental trajectory in both neurotypical and atypical children is the result of complex, ongoing interactions between genetic factors, i.e. the initial brain development programme, and environmental factors. Disruption of these brain development processes leads to a neurodevelopmental disorder (NDD) (HAS, 2018; INSERM 2019) [2].

Since Piaget's sensorimotor theory, clearly defined stages have been superseded and development is now viewed in terms of trajectories. The developmental trajectory refers to the evolutionary dynamics of behaviours and cognitive, social, emotional and biological skills over time. It emphasises intra- and inter-individual variability and the influence of contexts (family, cultural, environmental). Rather than limiting itself to fixed stages, contemporary research emphasises multiple, flexible and adaptable trajectories. (Jakson, 2023) [3].

It is through this lens that we must consider child development in 2025, based on two observations:

Studies based on neuroscience to better understand development have led to the identification of sensitive windows dependent on epigenetics and the microbiome.

An objective differential analysis of atypical trajectories allows neurodivergent profiles (ASD, ADHD, giftedness) to be considered not as deviations, but as variations in trajectories (Vaivre-Douret and Hamdioui, 2023) [4].

Early detection: why and how?

Early diagnosis of neurodevelopmental and behavioural disorders is essential because the development of a child's brain functions and skills begins *in utero* and progresses at a fairly well-established rate in neurotypical children, with the brain being particularly plastic, especially during the first 1,000 days of a child's life.

Studies by Gressens (INSERM, 2013; 2021) demonstrate the importance of a sensitive period, in the form of a 'window' during which appropriate stimulation promotes synaptic growth and neural regulation [5] Conversely, these same studies objectively demonstrate the impact of a lack of stimulation, leading to 'synaptic destruction'. However, "good stimulation" also implies emotional stability and an appropriate emotional environment. Differences in the pace of maturation, with longer "sensitive periods" for benefiting from stimulation and the environment, could be genetically determined. We can cite the study by Koenis *et al.* (2018, cited by Restrepo, 2022) demonstrating that the genetic relationship between global connectivity and intelligence increases during adolescence, explaining up to 87% of the variance at age 16.

In fact, the nervous system reaches full maturity around the age of 25, although the brain remains plastic throughout life.

Neuronal plasticity, learning and memory rely on the establishment of epigenetic events, and neuronal activity modifies, in particular, DNA methylation patterns and chromatin accessibility. In parallel (and sometimes combined with epigenetic susceptibilities), the environment can also have deleterious effects on brain maturation. In particular, premature newborns are exposed to many *stimuli* that are virtually non-existent in foetuses of the same age, such as excessive and repeated sensory stimulation, painful stimulation, stress, multiple neuroactive drugs, and the sudden loss of maternal and placental factors. Any environmental factor or medication that affects the brain is likely to alter some or all stages of brain development. The main ways these environmental factors (good or bad) can affect brain development are through epigenetic events that control things like how the genome is organised and packed, and therefore how genes are expressed (Gressens, 2021, p.907).

This observation highlights the need to rely on tools that enable early identification of the first signs of deviations from the typical trajectory.

The usual scales are developmental scales that allow the different areas of a child's competence at a given moment to be graded and compared against the norm.

To do this, we will cite tools such as:

- ✓ The functional motor development of young children (0-48 months) by Vaivre-Douret (1997)
- ✓ The revised Brunet-Lézine (2-30 months)
- ✓ The Bayley IV (16 days-42 months)

Children with neurodevelopmental disorders often have motor and tone disorders as well as sensory peculiarities, so complementary tools such as the DUNN-2 sensory profile or the Amiel-Tison neuromotor assessment are relevant additions.

More recently, observation of general movements has provided interesting insights into babies. General movements are spontaneous, complex and undirected movements observed in infants from the first weeks of life. They reflect the integrity of the developing central nervous system. Prechtl's general movement assessment is a standardised tool that evaluates the quality of these movements to predict neurodevelopmental outcomes. Longitudinal studies (Teschler et al., 2023; Wang et al., 2023) have shown that the trajectories of general movements, observed from the neonatal period to corrected age of three months, are strongly associated with neurodevelopmental outcomes at 12 months [6], [7].

Thus, we now have tools for assessing and identifying early signs of developmental trajectory deviations, combined with a precise understanding of maturation and synaptic modelling enabled by the environment and stimulation. These elements provide us with the arguments for implementing an intervention programme.

Early interventions

As we have just demonstrated, the first years of life are a period of maximum brain plasticity**,** during which neural networks are built and stabilised in response to environmental stimuli (Nelson et al., 2023). [8] Developmental trajectory models show that initial differences, if not compensated for, tend to widen over time (cumulative effect). Early intervention can therefore modify the trajectory by limiting the effects of risk factors (precariousness, toxic stress, screen exposure, educational deficiencies) and strengthening protective resources. These findings are supported by recent studies on brain plasticity and the ability of children to compensate for delays when properly stimulated. (Tallet, 2018; Zatorre et al., 2020; Blanke and Serino, 2022) [9], [10], [11].

In children with developmental coordination disorder, certain regions of the brain show overactivation when performing motor or cognitive tasks, which is interpreted as a sign of compensatory plasticity aimed at maintaining performance levels similar to those of typically developing children.

This is where psychomotor rehabilitation comes into its own. Psychomotor rehabilitation mobilises brain plasticity by offering targeted situations and learning experiences that engage impaired motor, cognitive and psychosocial functions in order to reduce, compensate for or eliminate deficits. The type of intervention chosen is tailored to the results of psychomotor assessments. In each case, behavioural changes or a reduction in cognitive load when performing a task must be objectively measured through tests before and after the intervention.

Psychomotor learning is based on repetition, which is essential for promoting brain plasticity. Hebb (1999, cited by Tallet, 2018) theorised that the repetition of simultaneous neuron activation strengthens their synaptic connections, thereby creating more robust neural circuits.

Thanks to advances in neuroscience**,** imaging data show that the environment and early social interactions directly influence the maturation of circuits related to language, emotional regulation and executive functions.

As a result, cognitive and socio-emotional enrichment programmes in early childhood lead to lasting improvements in academic, social and adaptive skills. (Sandbank et al., 2020; Fuller and Kaiser, 2022) [12], [13].

Furthermore, early prevention reduces the prevalence of poorly managed neurodevelopmental disorders and, above all, prevents comorbidities.

Psychomotor rehabilitation therefore acts as an "environmental enrichment" creating stimulating situations that induce behavioural and neuroplastic improvements. This enrichment promotes the production of new neurons and synapses, increases cerebral vascularisation and the size of support cells, both in cortical structures (occipital, parietal and temporal cortex) and subcortical structures (hippocampus, amygdala) and in the cerebellum (Rosenzweig & Bennett, 1996; Mohammed et al., 2002). These adaptations improve sensorimotor, cognitive, and psychosocial functions in various clinical contexts.

Play is a key element of psychomotor rehabilitation, actively stimulating cognitive, sensorimotor and psychosocial functions through creativity, discovery and problem solving. This activity exploits the individual's natural appetite for exploration and active learning, especially when the activities are guided. The role of the psychomotor therapist is therefore fundamental in structuring these sessions in such a way as to promote appropriate behaviours and support neuroplasticity (Palma et al., 2014).

Psychomotor therapy: what are we talking about?

The term psychomotor therapy was coined in the^{20th}century, but its origins are much older. As early as 427 BC, Platon spoke of the duality between the soul and the body. Aristote (310 BC) already referred to unity

in psychosomatics. According to Aristote's hylomorphism, "the soul gives form (morphé) to the body (hylé, matter), the former becoming the vital principle of the latter, which is conceived in close unity with the psyche". As for Hippocrates (420 BC), "Man must harmonise mind and body".

Thus, over time, many authors have spoken about the body and the psyche in different ways, leading to a constantly evolving concept: psychomotor function.

In the 17th century, Descartes believed that thought was above the body and predominant, which he described as: "I think, therefore I am[5] ". In this dualistic perspective advocated by Descartes, the mind and body function independently of each other. It was mainly from the end of the 19th century onwards that schools of thought began to focus on the question of the body. There was much reflection on the body and mind and the close links between them. The body is charged with meaning; it embodies the psyche. Phenomenologists ultimately demonstrated "Descartes' error"[6] , and the work of Merleau-Ponty (1945) is one example of this [14]. Indeed, contrary to Descartes' dualistic thinking, for these authors (Husserl[7] , 1913; Merleau-Ponty, 1945; Strauss[8] , 2000; Damasio, 1995), the body and brain interact very strongly with the environment through movement and the five senses, enabling us to interpret messages arriving in the fundamental sensory cortex and thus formulate strategies for reasoning and decision-making. Thus, according to phenomenological , existence precedes thought.

In 1947, Professor De Ajuriaguerra**,** a psychiatrist at St Anne's Hospital (Paris), where psychomotricity was born, set up three research centres: a psychology centre headed by Zazzo; a language centre headed by Borel-Maisonny; and a motor skills centre headed by Soubiran, who created the neuro-psychomotor assessment [15]. The aim of this centre was to detect and remedy disorders of language, reading, writing and arithmetic.

Fundamental concepts began to be discussed: the dimensions of space and time, rhythm, and muscle tone. *This was psychomotor rehabilitation!* Soubiran (1975) developed the psychosomatic relaxation technique that bears his name [16]. This was a new approach to the body that included the concept of relaxation.

From 1960 onwards, psychomotricity began to be taught, first in the form of short courses and then as a full course at the Pitié Salpêtrière hospital. In 1967, Ms Soubiran created the Institut Supérieur de Rééducation Psychomotrice (Higher Institute of Psychomotor Rehabilitation).

In everyday life, human activities are based on different areas of functioning. Among these, there are four that constitute the disciplinary field of psychomotor therapy:

- The five senses and perception
- Movements
- Emotions
- Reflection and thought

These four areas are interconnected, interacting and influencing each other. Together, they form a balanced system known as psychomotor function. This is what enables a person to control their movements, organise themselves in time and space, represent their body and emotions, express themselves and relate to others. All of this contributes to each person's adaptation to their physical and human environment.

In France, state-certified psychomotor therapists are specialists in psychomotor skills. They work in the fields of education and counselling, care and prevention.

According to Alonso-Bekier and Saint-Cast (2023), babies act and communicate from the moment they are born [17]. They convey emotions and information about their physical and mental state through their bodies. They engage in tonic-emotional dialogue, which allows them to interact with others. Their parents spontaneously enter into this form of bodily communication. Deprivation and need cause fluctuations in the newborn's muscle tone, such as increases or contractions. Appropriate responses from adults then promote a decrease in muscle tone, or relaxation. The baby can then calm down and relax. These alternating muscle contractions and relaxations are intense at the beginning of life. They then become regulated, but these emotion-related reactions never disappear. Throughout life, tension is associated with negative emotions and relaxation is linked to security and satisfaction (Wallon, 1949; De Ajuriaguerra, Anguelergues, 1962; Robert-Ouvray, 2020) [18], [19]. The body is constantly subject to alternating flows of emotions resulting from interactions with others. The integration of this bodily state is one of the foundations of self-awareness.

[5] Discourse on Method, 1637.
[6] A. Damasio. *Descartes' Error* (1995); *The Feeling of What Happens* (1999); *Spinoza Was Right* (2003)
[7] Ego cogito and one's own body "*All consciousness is consciousness of something."*

[8] The body is the vehicle of being in the world.

Muscle tone contributes to both maintaining posture and controlling movements. It feeds proprioception and therefore the integration of the body. As it also enables the identification and expression of emotions, muscle tone is the foundation of both movement control and the subject's experience, as well as self-awareness.

Physical activity plays a fundamental role in psychological development.

Muscle tone is a fundamental factor that Wallon and, more recently, Robert-Ouvray have placed at the centre of all functions. Thus, the brain of a newborn is pre-wired for adaptive experiences through motor patterns of curling up, straightening up, twisting, walking and grasping, which are embedded in motor projects, provided there are no impediments such as brain damage. On the other hand, the tension of movement in terms of its quality and quantity will be affected by emotions and affective disturbances. The body then becomes the partner of the psyche. However, the body is underpinned by muscle tone, which is of great importance here. It is thanks to variations in muscle tone that the emotional state is expressed through the body with a dual role: that of communication and bodily experiences. (Alonso-Bekier, 2019, p. 7) [20].

The development of our neural networks stems from electrical activity triggered by sensory stimuli originating both from within the body (interoception, viscera, proprioception, etc.) unconsciously, and from outside (taste, smell, sight, touch, hearing). All this information contributes to the creation of brain networks and enables the perception and awareness of the body.

All early experiences provide a wealth of exteroceptive sensory information, but above all proprioceptive information, which supports the representation of the body by promoting the mental construction of its different parts, their position in space and the image we perceive of ourselves. What we call body schema is developed from foetal life onwards through the sensory information received during our experiences. The fluctuation and richness of these sensory experiences modify and refine the representation we have of our body over time. This representation is therefore not immutable and evolves throughout life in accordance with the changes our body undergoes, such as during puberty but also as we age. This integration and accurate representation of the body then becomes the key to mastering our gestures and movements, balance, and complex and adjusted praxes. It is also this bodily foundation that allows us to act and interact with others, to connect through tonic-emotional dialogue.

Beyond mastery of movement, body representation also supports academic skills, particularly linguistic skills and the prerequisites for understanding mathematics.

With the first movements and, more specifically, learning to walk, the intensity and richness of sensory stimuli and social interactions increase, which helps children acquire new skills, such as language, through the activation of perception-action loops**.**

Vincent (2022) explains that the perception-action link also plays a role in learning intellectual skills [21]. In order to learn to count, children must rely on concrete, hands-on experiences. It is by using their fingers or manipulating objects that children learn to count. These physical experiences allow them to physically experience the concept of numbers and to represent it, which is a necessary step in conceptualisation at the cerebral level. It therefore seems necessary for children to be able to move and experiment, discovering the world using all their senses, in order to promote learning through movement based on the perception-action pairing rather than favouring immobility. This perception-action pairing has the particularity of enabling the creation of new neural connections and lifelong learning, but it must be stimulated through new experiences. Encouraging children to listen to their bodily sensations also promotes availability and engramming.

We can now say that under the dual effect of physiological maturation and exchanges through the body, children become capable of acting voluntarily. As a result, physical activity is the reference point for the various functions necessary for learning, such as the integration of the body in space and time.

This is exactly what the psychomotor therapist will encourage. During sessions, the body is put into play, stimulating proprioception, muscle tone and its adjustment, and thereby knowledge and integration of the body. (Saint-Cast, 2021) [22]. This development is expressed through better control of movement (fine motor skills, graphic movement), more stable balance and greater confidence in one's abilities. Of course, all these experiences offered during treatment take place within a spatial and temporal dimension.

In their treatment, psychomotor therapists use either a top-down or bottom-up methodology, depending on their objectives.

According to Habib (2023), psychomotor therapists are able to treat dyspraxia and, by extension, all graphic disorders [23]. He presents the most commonly used method as "bottom-up" treatment, which strengthens the basic skills necessary for all motor functions, such as tonic regulation, balance and all sensory and perceptual-motor aspects. More recently, more pragmatic, top-down methods have been developed that do not seek to act on the motor foundations but directly on motor activity through targeted tasks in everyday activities.

The top-down approach is recommended by the HAS and INSERM for developmental coordination disorder, which illustrates our commitment to best practice recommendations. To achieve this, it is necessary to develop research in psychomotor therapy using appropriate methodological tools that enable impact measurements (Alonso-Bekier and Ragon, 2024) [24].

To conclude

This paper has shown that we now have a good understanding of developmental mechanisms, brain plasticity and tools for the early detection of abnormal developmental trajectories. This highlights the importance of early intervention, particularly for children with high risk factors for neurodevelopmental disorders (such as premature babies, for example). The psychomotor approach is central to this early support for children. Raising awareness among all those involved with young children and systematic early assessments using appropriate and validated tools are recommended.

Conflict of interests

The author declared no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

References

1. Restrepo, G. et Venet, M. (2022). *Brain, development and learning.* JFD Editions, Montréal, Québec.

2. I.N.S.E.R.M. (2019). *Collective Expertise: Summary and recommendation—Developmental coordination disorder or dyspraxia*. Collection collective Expertise, EDP Sciences Editions, Les Ulis, France. https://www.inserm.fr/expertise-collective/trouble-developpemental-coordination-ou-dyspraxie/

3. Jackson, J. (2023). Early Childhood Learning Trajectories: The Evidence Base. *Australian Education Research Organisation*. https://edresearch.edu.au/sites/default/files/2023-05/learning-trajectories-evidence-base-report.pdf

4. Vaivre-Douret, L., & Hamdioui, S. (2023). Developmental Trajectory of Depressive Symptoms from Early Childhood through High School in Children and Adolescents with a High Intellectual Potential. *Children, 10*(11), 1738. https://doi.org/10.3390/children10111738

5. Gressens, P. (2021). The development of the nervous system: from neurogenesis to the structuring of neural networks. *Bulletin of the National Academy of Medicine, (*205), 8, 901-907. https://doi.org/10.1016/j.banm.2021.05.014

6. Teschler, U., et al. (2023). General Movements trajectories and outcome at 12 months in very preterm infants. *Scientific Reports, 13*(1), 49037. https://doi.org/10.1038/s41598-023-49037-w

7. Wang, J., et al. (2023). Early markers of neurodevelopmental disorders based on general movements in preterm infants. *Frontiers in Pediatrics, 11*, 634. https://doi.org/10.3389/fped.2023.10163464

8. Nelson, C. A., Gabard-Durnam, L., & Fox, N. A. **(**2023**).** Annual Research Review: Early intervention viewed through the lens of developmental neuroscience**.** *Journal of Child Psychology and Psychiatry,* 64(4), 497–520. https://doi.org/10.1111/jcpp.13858

9. Tallet, J. (2018). Contribution of research on brain plasticity to understanding the effects of psychomotor rehabilitation: evidence and reflections. *A.N.A.E.,* 153, 001-012

10. Zatorre, R. J., et al. (2020). Neural plasticity and learning: A review of the evidence. *Nature Reviews Neuroscience*, 21(3), 125-140.

11. Blanke, O. et Serino, A. (2022). "The Body in Action: How the Brain Maps Body and Space." *Annual Review of Neuroscience*, 45, 67–89.

12. Sandbank, M., Bottema-Beutel, K., Crowley, S., Cassidy, M., Dunham, K., Feldman, J. I. & Woynaroski, T. G. (2020). The effects of early intervention on social communication outcomes for children with autism spectrum disorder: A meta-analysis. *Journal of Child Psychology and Psychiatry,* 61(8), 853–869. https://doi.org/10.1111/jcpp.13169

13. Fuller, E. A., & Kaiser, A. P. (2022). The efficacy of early interventions for children with autism spectrum disorders: A systematic review and meta-analysis. *Journal of Autism and Developmental Disorders,* 52(1), 130–150. https://doi.org/10.1007/s10803-021-05202-5

14. Merleau-Ponty, M. (1961). *Phenomenology of perception*. Paris, Gallimard (1st ed.1945).

15. Ajuriaguerra, J. de ; Angelergues, R. (1962). From psychomotor skills to the body in relationships with others, regarding the work of Henri Wallon, *Psychiatric Evolution,* n° 27, p. 3-25.

16. Soubiran, G.-B. ; Coste, J.-C. (1975). *Psychomotricity and psychosomatic relaxation,* Doin.

17. Alonso-Bekier, S. et Saint-Cast, A. (2023). The confined body today: Psychomotor consequences of restrictions that did not only affect the expression of emotions through facial expressions, *Enfances & psy*, *3*(97), 57-63. https://doi.org/10.3917/ep.097.0057

18. Wallon, H. (1942). *From action to thinking*. Flammarion, Paris, rééd. 1970.

19. Robert-Ouvray, S. (2020). *Baby's psychomotor skills: building body-mind connections,* Desclée de Bower.

20. Alonso-Bekier, S. (2019). What about children with high intellectual potential (H.I.P.), their bodies, their psychomotor profile and possible psychomotor disorders?*Évolutions psychomotrices,* 108, 76-90.

21. Vincent, L. (2022). It all starts with the body. Odile Jacob, Paris.

22. Saint-Cast, A. (2021). Is psychomotor therapy a factor in resilience during a pandemic? *Psychiatric Information*, 97 (7), p. 565-568. https://doi.org/10.1684/ipe.2021.2301

23. Habib, M. (2023). *The génious of Dys*. Éditions sciences humaines, Auxerre, France.

24. Alonso-Bekier, S. et Ragon, I. (2024). *Research methods in psychomotor therapy*. DeBoeck, Louvain la neuve.

ОБЗОРНАЯ СТАТЬЯ

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ҚАЗАҚСТАН РЕСПУБЛИКАСЫНДАҒЫ БАЛАЛАРДЫ ОҢАЛТУ ҚЫЗМЕТІНІҢ ҚАЗІРГІ ЖАҒДАЙЫ МЕН ДАМУ ПЕРСПЕКТИВАЛАРЫ

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Түйіндеме

Балаларға оңалту көмегін қоса алғанда, денсаулық сақтау қызметтерімен қамту басым бағыт болып табылады, өйткені оңалту қызметтері балаға жарақаттануына, ауруларына немесе денсаулығының өзге де бұзылуларына, сондай-ақ функционалдық мүмкіндіктерінің туа біткен өзгерістеріне байланысты қажет. Мақалада мүгедектіктің медициналық-демографиялық көрсеткіштерін, балалар мүгедектігінің құрылымын, оңалту орталықтарының желілері мен ресурстарын талдау негізінде Қазақстан Республикасындағы балаларды оңалту қызметінің қазіргі жай-күйіне шолу ұсынылған. Стационарлық және амбулаториялық-емханалық жағдайларда балаларды оңалту емімен қамтуға, сондай-ақ 2024-2025 жылдардағы деректер динамикасына ерекше назар аударылды. Оңалту көмегін көрсететін ұйымдардың материалдық-техникалық базасы мен кадрлық қамтамасыз етілуі қарастырылады, бұл оң үрдістерді де, жалғасып жатқан проблемаларды да анықтауға мүмкіндік береді. Талдау нәтижелері қызметтердің қолжетімділігін кеңейтуді, мамандардың біліктілігін арттыруды және инфрақұрылымды жаңғыртуды қоса алғанда, кешенді шаралар есебінен Қазақстанда балаларды оңалту жүйесін жетілдіру қажеттілігін көрсетеді, бұл балалардың табысты әлеуметтік бейімделуінің маңызды шарты болып табылады.

Түйін сөздер: оңалту, мүгедек балалар, оңалту орталықтары, медициналық көмек, Қазақстан

СОВРЕМЕННОЕ СОСТОЯНИЕ И ПЕРСПЕКТИВЫ РАЗВИТИЯ СЛУЖБЫ ДЕТСКОЙ РЕАБИЛИТАЦИИ В РЕСПУБЛИКЕ КАЗАХСТАН

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