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THE IMPORTANCE OF NEUROPSYCHOMOTOR DEVELOPMENT BETWEEN 0-2 YEARS

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Abstract: *The present research wanted to demonstrate and support the importance of the neuropsychomotor development in optimal conditions of a non-disabled child in the first 2 years of life as well as the importance of the intervention through a series of stimulation techniques, methods and movement games. In order to carry out the research, a series of initial, intermediate and final tests were used to see the evolution in the age stages. The tests used were: evaluation of physical development, evaluation of archaic reflexes, evaluation of pre-tension, evaluation of balance, Denver Test- evaluation of slowing of internal development and Portage Test - evaluation of chronological and biological age of the child. Following the application of the therapeutic techniques and methods, the objectives set either at the general level or at the level of each stage have been met to a satisfactory extent.*

Key words: *new-born, harmonious development, movement games.*

1. Introduction

Scientists who have approached the subject of human development have come to the conclusion that they manifest on different areas in all stages of human existence, so that the researchers highlight three major landmarks of human development: physical, cognitive and psychosocial. [9]

According to Bornstein and Hendricks (2013, p. 307) early childhood is a critical period in ontogeny and early physical, cognitive, and socioemotional growth constitute foundations of future development. In consequence, disabilities sustained in early childhood can have lasting effects. [2]

Children's neuropshycomotor development is a process that begins in the uterus then progresses, stage by stage, and at each stage the child acquires new skills.

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Although it has a fixed sequence, the rhythm of development varies from child to child, allowing the establishment of normality limits and minimum and maximum ages in the development milestones. [8]

According to dynamics systems theory, infant motor development emerges from the interaction between factors within the child and in the environment (Adolph & Hoch, 2019). Therefore, many different factors are responsible for this variability in infant motor development. [1]

Largo et al. (2001), demonstrated that timed motor performances between 5 and 18 years are characterized by a long-lasting developmental change and a large interindividual variation. Therefore, a well standardized test instrument and age-specific standards for motor performances are necessary preconditions for a reliable assessment of motor competence in school-age children. [12]

Denckla (1973) showed that there has been a growing awareness that motor functions appear and change not only age-specifically, but they are also highly variable within an age group. [7]

A study performed by Gasser, Rousson, Caflisch & Jenni (2010) demonstrated that associated movements are involuntary movements that accompany voluntary movements of particular importance are contra lateral associated movements, where the symmetrical non-active limb shows movements. The assessment of associated movements is important in determining mild to moderate motor dysfunction. Typically developing children and adolescents also show associated movements to a varying degree, depending on motor task. [3]

The environment in which the child is inserted and motor opportunities offered to this is essential for a good motor development.

In a study made by Robert da Silva et al. (2017) found a significant correlation to motility materials and materials to motor stimulation for girls. For the boys the motor performance is explained by the available variables of fine and gross motor skills and for the girls by materials of motor stimulation, stimulation variety and materials of fine and gross motor skills. [4]

The development of children may occur in different ways, depending on the social environment in which they are inserted. [11]

In the early years of a child's development the physical composition of the environment establishes itself as one of the first means of motor experience. Environmental stimulation plays a critical role in optimal human development during the early stages of life and an optimal level occurs with strong contextual support. It is well accepted among develop mentalists that motor-perceptual-and cognitive development are fundamentally interrelated. This suggests that status of motor development is an important factor in overall child well-being. [13]

The social cultural context in which a child is reared forms certain demands for his/her motor behaviour, favouring specific aspects of motor development and impairing others. A very influential factor (and consequently a very significant educational means) is the use of

intervention movement programs. A developmentally adequate movement program can enhance motor development, thus preventing the long term negative consequences that an unfavourable influence of several genetic or the aforementioned environmental factors may have. [6]

Kinetotherapy is one of the therapies that uses movement as the main means of action, and depending on the goals pursued it can lead to: recovery - addressed to the somatic-functional level, motor and psychomotor; re-education of compensatory functions - addressed to partially reversible and irreversible deficiencies.

In addition to the other forms of therapy, requires greater attention to the intervention program, because it must be tailored to each individual, the therapeutic steps must be individualized. [5]

More rigorous longitudinal studies using outcome measures focusing on movement quality are recommended to understand any long-lasting influence on the motor skills in these infants. [10]

The objectives pursued in the research were the following: promoting the health and well-being of the child, stimulating the inhibition of reflexes, stimulating the installation of the voluntary movement, educating the motor schemes specific to the age, acquiring and increasing the stability and postural balance, preventing the vicious attitudes, social and cognitive stimulation.

1.1. Research hypotheses

The child's approach on all development directions (motor skills, cognition, social, language) is the most effective approach, because these directions influence each other so that optimal motor development would not be possible without good cognitive, social, psychic development, and vice versa.

2. Materials and Methods

2.1. Participants and Procedure

The research has the length of over two years. The environments in which the research was possible are represented by the personal and outdoor residence, places where there was the possibility to follow the evolution and the stages on which the present research is based.

The case is of a new-born, who received score 9, after testing the APGAR score, performed by doctors.

The subject of the research was studied from the moment of birth and was chosen for the following reasons:

- the subject is classified in the “new-born” category;
- subject born in appropriate medical conditions and who received the consent of the specialist doctors regarding the normal development until the moment of birth, by testing the APGAR score;
- the existence of the possibility to work continuously for a long period of time, with the purpose of observing the evolution.

2.2. Research Design

The actual research was initiated by the specific evaluations of the child's age, among which reflexes as a way of revealing the maturity of the nervous system, based on which observation sheets could be elaborated. During the evolution and at the same time of the growth and development of the new-born, the observation sheets were completed periodically, depending on the acquisitions and the specific moment of the acquisitions, until the end of the effective working period with it.

The training program aimed to combine motor activities with those of cognitive, social development, self-service, language and was a good approach, because all these areas influence each other.

The examination performed within the limits imposed by the new-born did not consist in the classic way of using the anthropometric framework of symmetry, but in most cases it was possible through direct subjective observation, palpation, as well as performing specific measurements of height, body weight, and skull perimeter. These initial indices were measured during the growth period up to two years, to observe how the situation evolves and whether it develops within the normal parameters of the biological age.

To carry out the research, a series of initial, intermediate and final tests were used to see the evolution in the age stages.

The tests used were: Evaluation of physical development, Evaluation of archaic reflexes, Evaluation of pre-tension, Evaluation of balance, Denver Test and Portage Test.

3. Results

From the point of view of the new-born it can be observed that there were no problems during the working period, as there are no complications that prevent the normal development of the child.

From a psychic point of view, the subject of the research adapted to the environment in which the intervention was performed, due to the matching of the workspace according to his age and his needs.

The open space, allowed the relationship between the physiotherapist and the child to be presented in the form of a good collaboration, as much as it allows the level of understanding of a child during the developmental period.

The progress made was possible with the help of evaluations: initial (birth), intermediate (3 months, 6 months, 12 months, 18 months) and final (2 years).

Data on physical development Table 1

Parameters		**W**	**H**	**P.S.**
I.E.		3,150	50	33,0
Int. E.	3 months	5,200	57	36,5
	6 months	7	64	39,0
	12 months	8,200	72	41,0
	18 months	11,20	86	43,0
F.E.		13	92	44,0

Note*: I.E. – Initial evaluation (birth), Int. E. – Intermediate evaluation, F.E. – Final evaluation (2 years), W-weight (kg.), H-Height (cm.), P.S. – Perimeter of the skull (cm.)*

Evaluation of archaic reflexes Table 2

	I.E.	*Int. E.*			*F.E.*
		6 months	*12 months*	*18 months*	
C.R.	*P.*	*A.*	*A.*	*A.*	*A.*
S.R.	*P.*	*P.*	*A.*	*A.*	*A.*
F.S.R.	*P.*	*P.*	*A.*	*A.*	*A.*
Ste. R.	*P.*	*A.*	*A.*	*A.*	*A.*
Sta. R.	*P.*	*P.*	*A.*	*A.*	*A.*
M.R.	*P.*	*A.*	*A.*	*A.*	*A.*
C.T.R.	*P.*	*P.*	*A.*	*A.*	*A.*
Ca.P.R.	*P.*	*A.*	*A.*	*A.*	*A.*

Note: *I.E. – Initial evaluation (birth), Int. E. – Intermediate evaluation, F.E. – Final evaluation (2 years), C.R - Clamping reflex, S.R. - Sucking reflex, F.S.R. - Fixing sucking reflex, Ste. R. - Stepping reflex, Sta. R. - Standing reflex, M.R. - Moro reflex, C.T.R. - Cervical tonic reflexes, Ca.P.R. - Cardinal points reflex, P. – Present, Abs. – Absent*

Pre-tension assessment Table 3

I.E.		Lack of postural balance
Int. E.	3 months	Balance in low doll position
	6 months	Balance in ventral and dorsal lying Balance in the high doll position
	7 months	Balance in the sitting position
	9 months	Balance in quadrupeds
	10 months	Good lateral balance with wide support base
	12 months	Balance in orthostatic
	18 months	Balance in walking
F.E.		Total balance

Note*: I.E. – Initial evaluation (birth), Int. E. – Intermediate evaluation, F.E. – Final evaluation (2 years), M. - month*

Balance assessment Table 4

I.E.		Clamping reflex
	6 m	Cubital palmar grip
	7 m	Total grip
	8 m	Clamping between the fingerboard and thumb opposition
	9 m	Clamping by fine tweezers
	10 m	The existence of a dominant hand
	12 m	Clamping between the police and the fingers II, III, IV
F.E.		Precise clamping movements fineness

Note*: I.E. – Initial evaluation (birth), Int. E. – Intermediate evaluation, F.E. – Final evaluation (2 years), M. - month*

Evaluation by Portage test Table 5

	Initial evaluation (one year)		**Final evaluation (2 years)**	
Socialization level	1,25	1 year and 3 months	2,29	2 years and 2 months
Level of verbalization	1.06	1 year and 1 month	1,64	2 years and 2 months
Self-service level	1,23	1 year and 3 months	2,31	2 years and 4 months
Cognitive level	1,2	1 year and 2 months	2,25	2 years and 3 months
Motor lever	1,22	1 year and 3 months	2,6	2 years and 6 months
IQ	112		114	
Chronological age	1,06	1 year	1,95	2 years
Mental age	1,19	1 year and 2 months	2,22	2 years and 3 months

Table 6

Evaluation by Denver test

Age	**Language**	**General movements**	**Fine movements**	**Social skills**
0-3 months	3/4	4/4	2/2	4/4
3-5 months	3/3	4/4	5/5	2/2
6-9 months	2/2	3/3	4/4	2/2
9-12 months	3/3	2/2	2/2	2/2
12-18 months	1/2	2/2	4/4	2/2
18-24 months	2/5	5/5	2/3	2/2
Final score	14/19	20/20	19/20	14/14

4. Discussions

Table no. 1 shows the evolution of physical development, the weight is on an uphill slope, from the moment of birth when the child reached 3,150 kg. until the age of two years when the child reaches the weight of 13 kg. The upward

evolution of the weight indicates a suitable framework for the child's ability to develop from a motor point of view. Height evolution is ascending, from the moment of birth when the child was 50 cm. and up to two years when the baby was 92 cm. The upward trend indicates an appropriate height for the child's ability to grow in terms of motor and the ability to explore the environment. The evolution of the perimeter of the head is ascending, from the moment of birth when the child was 33 cm after the measurement and at two years when the child was 44 cm after the measurement. The evolution within the normal limits of the values indicates that, inside the cranial box, the brain has developed under normal conditions.

Table no. 2 presents the evolution of the archaic reflexes and it is observed that the cardinal points reflex lasted until the age of 3 months, the cervical tonic ones up to 6 months, the Moro reflex up to 4 months, the orthostatic reflex up to 6 months, fixation for sucking 9 months, the reflex of sucking 10 months and the catch until the completion of 3 months.

The results of the pre-tension evaluation are presented in the table no. 3. The initial evaluation at birth presents the grip reflex, which persists for up to 3 months, when it is partially inhibited, giving rise to the movement or attempt of the grip with the whole palm. As it develops, at 6 months the child grabs the object out of the palm, on the cubital side, with minimal participation from the police by opposition. At 7 months the grip is made digitally with all the fingers and in the middle of the palm. At 8 months the grip continues towards the process of fineness of the movement so that the object is maintained between the radial palms and the police, who participate more strongly through the opposition. At 9 months by appropriate stimulation the presence of fine movement between police and index is observed. At 10 months the child tends to perform certain grasping tasks with only a certain hand which will later become the dominant hand. At 12 months the fineness of the movement continues by involving the fingers II, III and IV in the thought of an object so from this moment it is obvious the trait of the fine movement, compared to the coarse one of the first stages. The final evaluation from two years demonstrates that the grip activity was optimally developed; each movement made by the child is precise, direct, without causing the object to escape.

From the data obtained in the evaluation of the balance (table 4) it can be specified that balance is acquired around the same age when it is normal to acquire some psycho-motor stages, which the child also has travelled. Thus, at the first intermediate assessment, there is a good balance in the position of the low doll. At 6 months the balance develops by the ability to maintain posture in the positions lying ventral, dorsally cultured, as well as in the tall doll. At 7 months the balance in the sitting position allows the posture to be maintained for a longer time. At 9 months the child achieved balance in the quadruped position as well as during the shift in this position. At 10 months the lateral balance is stable so the child can easily move laterally without unbalancing. At 12 months there is a good balance in the orthostatic position, the baby being able to stand up and hold the position for several minutes. At 18 months

there is a good balance on the go with good control over the movement. At 22 months the subject understudy has a total balance of both static and dynamic positions, it is able to control and regulate its body position.

Table no. 5 presents the results obtained in the Portage Test. At the initial testing, performed at the age of one year, the child obtained a value of 1.25 at the level of socialization, and at the final testing (2 years), the value of 2.29. Regarding the level of verbalization, the initial value was 1.06 and the final value was 1.64. At the Self-service level, the subject obtained the initial value of 1.23 and finally the value of 2.31. The cognitive level initially registered the value of 1.2 and finally 2.25. At the motor level there is also an improvement, the girl initially recorded 1.22 and finally 2.6. The IQ increased from 112 to 114. Increasing results were registered regarding the chronological and mental age, the child developing normally.

Table no. 6 presents the results of the Denver Test. This test helped us to evaluate the inner development. The following aspects were pursued: language, general movements, fine movements and personal social skills. The final scores show a good evolution of the child, after two years obtaining the following results: in the language category 14 of 19 items, 20 of 20 items for general movements, 19 of 20 items for fine movements and 14 of 14 items for social skills.

5. Conclusions

The present research wanted to demonstrate and support the importance of the neuropsychomotor development in optimal conditions of the child in the first 2 years of life, as well as the importance of the intervention through a series of stimulation techniques and methods. In order to maintain a healthy state within the normal parameters of the age, the child must be followed, stimulated and helped where he/she fails.

Following the application of the therapeutic techniques and methods, the objectives set either at the general level or at the level of each stage have been met to a satisfactory extent.

During the pursuit it was possible to see the evolution, by acquiring each stage of development normally, from the ability to have control of the head, to the control of the trunk and then of the limbs. Other elements concerned were the pre-tension and its evolution from the level of reflex to voluntary pre-tension and high-precision movements, the postural balance from its total absence to the control of the body under different movement conditions, but also of the physical elements such as weight, height and perimeter of the head, which provided clues about the future condition of the child, the future way in which the child may develop.

Equally, it was followed and intervened on the development of the levels of socialization, self-service, cognition and verbalization, the assessments demonstrating a good course on all levels.

The use of the proposed training model had positive effects on the child, allowing them to develop and progress naturally for each age range. The therapeutic intervention fulfilled its role as it provided the child with the premises for

acquisitions, allowing him to explore independently.

The means of contact of the child have played a major importance in its development, by stimulating and encouraging various activities, but also by providing emotional support to determine these activities.

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