DYNAMIKA TELESNÉHO VÝVINU A NEUROSONOGRAFIA PRVÉHO ROKA PREDČASNE NARODENÝCH DETÍ PO TELESNOM REHABILITAČNOM PROGRAME

DYNAMICS OF PREMATURE INFANTS' PHYSICAL DEVELOPMENT AND NEUROSONOGRAPHY OVER THE FIRST YEAR AFTER A PHYSICAL REHABILITATION PROGRAMME

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ABSTRACT
Background: Premature birth and care of premature babies is a pressing problem of the modern world.
Objectives: To determine the dynamics of physical and psychomotor development, the state of the musculoskeletal system (MS) of premature infants in the first year of life under the influence of physical therapy (PT).
Research sample and method: The study involved 60 infants, which were divided into 4 groups according to the degree of prematurity. The assessment of children's physical development was carried out on anthropometric indicators. The degree of damage of the nervous system was examined by neurosonography. Children undergo the PT programme based on INFANIB test scores in 0, 3, 7, and 12 months of adjusted gestational age.
Results: When using the PT programme, it was found that during the first three months of life, children with I – III degree of prematurity almost doubled their body weight, in the group with IV – it was increased by 76.9 %. The analysis of the results of neurosonography revealed positive dynamics in all the groups. Congenital crooked neck was observed in 30 % of children with stage III prematurity, which was the highest among the identified pathologies of MS. At the end of the PT programme, these diagnoses were withdrawn.
Conclusions: Indicators of anthropometric changes, analysis of the dynamics of neurosonography and the prevalence of pathology of the MS revealed positive changes in all groups of children on each stage of the study, which should be considered according to the result of timely and rational use of PT.

Key words: Premature babies. Physical development. Musculoskeletal disorders. Physical therapy.

ABSTRAKT
Východiská: Predčasný pôrod a starostlivosť o predčasne narodené deti je častým problémom moderného sveta.
Ciele: Zistiť dynamiku fyzického a psychomotorického vývoja, stav pohybového aparátu (PA) predčasne narodených detí v prvom roku života pod vplyvom fyzikálnej terapie (FT).
Výskumná vzorka a metóda: Štúdie sa zúčastnilo 60 dojčiat, ktoré boli rozdelené do 4 skupín podľa stupňa nedonosenosti. Hodnotenie fyzického vývoja detí sa uskutočnilo na antropometrických ukazovateľoch. Stupeň poškodenia nervového systému bol vyšetrený neurosonografiou. Deti boli zaradené do programu FT na základe výsledkov testov INFANIB v 0, 3, 7 a 12 mesiacoch upraveného gestačného veku.
Výsledky: Pri použití FT programu sa zistilo, že počas prvých troch mesiacov života deti s I-III stupňom nedonosenosti takmer zdvojnásobili svoju telesnú hmotnosť, v skupine s IV – bola zvýšená o 76,9 %. Analýza výsledkov neurosonografie odhalila pozitívnu dynamiku vo všetkých skupinách detí. Vrodený krivý krk bol pozorovaný u 30 % detí s nedonoseným štádiom III, čo bolo najvyššie spomedzi identifikovaných patológií SM. Na konci programu PT boli tieto diagnózy zmiernené.
Záver: Ukazovatele antropometrických zmien, analýza dynamiky neurosonografie a prevalencia patológie SM odhalili pozitívne zmeny vo všetkých skupinách detí v každej fáze štúdie, čo treba považovať za výsledok včasného a racionálneho využívania FT.

Kľúčové slová: Predčasne narodené deti. Telesný vývoj. Ochorenia pohybového ústrojenstva. Fyzikálna terapia.

INTRODUCTION

In recent decades, there has been a qualitative improvement in the maintenance of pregnancy, preservation and childbearing to acceptable birth terms with various complications and diseases during pregnancy (Damato et al., 2016; Puthussery et al., 2018; Lademann et al., 2021). Modern technology of artificial insemination has made it possible for millions of childless families to have children. However, this breakthrough in reproductive medicine has shown an acute need for rehabilitation and physical therapy (PT) of newborn children with a history of a burden (Øberg et al., 2012; Luo et al., 2013; Black et al., 2016; Liu et al., 2021). Particularly acute problem of restorative processes is in preterm infants (PI) of different gestational periods, which are increasingly called prematurely born, for ethical reasons (Khoshnood Shariati et al., 2015; Freitas et al., 2021). The risks of developing a PI are defined by the term of gestation, physical and physiological criteria. Periods from birth to three months, from three to six, from six to nine and from nine to twelve months are the ones that physiologically establish and determine the degree of development of a PI (Hazanov,

2014; Palchik et al., 2014; Shabalov, 2020a).

The World Health Organization (2012) in the report highlights an increasing trend in the number of PI in all countries, and among them there are countries with a high standard of living and medical care. One of the causes of this phenomenon is the high level of medicine, which allowed reducing the threat of pregnancy disruption, to prevent the various intrauterine anomalies development, to reduce intrauterine mortality and infant mortality, to give joy of motherhood and paternity to many families.

Among the pathological changes of PI, first of all, ~~it~~ the lesions of the nervous system and internal organs should be noted, which are reflected in their functional immaturity (Hazanov, 2014; Palchik et al., 2014; Shabalov, 2020). Congenital hereditary and genetic changes in bone tissue also lead to pathological dysfunctions of the musculoskeletal system, which requires timely attention and correction (Hryhus et al., 2017). Sufficiently common congenital abnormalities, such as cardiovascular disorders, require skilled treatment and PR (Vitomskiy, 2015; Vitomskiy et al., 2017).

Lesions of the central nervous system, metabolic disorders, congenital orthopedic diseases and congenital heart defects are the factors that lead to disruption of motor functions, mental and physical development, and as the consequence of childhood disabilities (Vitomskiy et al., 2015; Miller et al., 2016; Torchin et al., 2016; Batshaw et al., 2019; Dereka, 2020; Dyba et al., 2013).

The development of PI has its own peculiarities, depending on their age of gestation and physical development, and, as a rule, received treatment in the intensive care units that determine the selectivity of the use of methods and means of PT and their strict coordination with the medical process (Yatsyk, 2012; Sanjay et al., 2013; Lazareva et al., 2017; Lademann et al., 2021). In addition, physical development is a major factor in substantiating PT programmes among children and other congenital pathologies (Vitomskiy et al., 2018).

In the cases of limited possibilities for the use of medical treatment, especially in children burdened with allergic reactions, PT becomes the main means that allows bringing PI to the maximum level of its physical and psychomotor conditions (Vasylenko, 2015; Lazarieva et al., 2016; Vasylenko et al., 2016; Liu et al., 2021).

OBJECTIVE

To determine the peculiarities of the dynamics of physical development, the neurosonography results, the condition of the musculoskeletal system of PI of different degrees in the first year of life under the influence of the PT programme.

METHODS

Sample group

The study involved 60 new-born infants, who were examined on the basis of the Children's Branch No. 6 of the Clinical Diagnostic Centre of Kyiv. The group included only premature babies, who were under control throughout the entire implementation of the programme receiving an appropriate therapeutic treatment. Depending on the stage of prematurity, the children were divided into groups considering gestational age (GA) and birth weight (BW): I stage (n = 23) with GA at 35 – 37 weeks and 2001 – 2500 g of BW, II stage (n = 18) with GA at 32 – 34 weeks, 1501 – 2000 g of BW, III stage (n = 10) with GA at 29 – 31 weeks, 1001 – 1500 g of BW, and IV stage (n = 9) with GA least than 29 weeks and up to 1000 g of BW. Parents of the studied children were acquainted with the tasks of the study and signed an informed consent form. The research was approved by the Institutional Ethics Committee (number 2/2014) and was carried out in compliance with the international principles of the Helsinki Declaration of the World Medical Association (2013), and in accordance with the Law of Ukraine "Fundamentals of Ukrainian Legislation on Healthcare" (1992) on ethical norms and rules for conducting medical research involving human.

Methodology

The results of the application of the PT programme were evaluated in the main areas: physical development (age criteria); the presence of accompanying pathologies of the musculoskeletal system (according to the conclusions of medical specialists); the presence of changes in the central nervous system (according to the results of neurosonography).

The staged evaluation of the program took place at 3, 7 and 12 months, considering the corrected gestational age according to the INFANIB scale.

From the anthropometric indicators, body mass (BM), body length (BL), chest circumference (CC) and head circumference (HC) were studied. Neurosonography (NS) was designed to identify

lesions of the central nervous system, the degree of immaturity and the lesion of the brain of a PI. The congenital and acquired diseases of the Musculoskeletal system and the degree of their manifestations were determined by the orthopedic physician. The Apgar score was performed by a neonatologist at the first and fifth minutes after birth. Increasing the points by 2 or more at the fifth minute is a positive trend.

Children completed a PT programme, which consisted of three stages according to the status assessment for INFANIB: preparation stage – pathological condition; the stage of active measures – transient abnormalities; correction stage – norm. Depending on the assessment, the programme included medical gymnastics, massage, swimming, light therapy, the method of "kangaroo mother care", the method of dry immersion. Conducting PT measures in rehabilitation departments was carried out continuously at intervals of 1 – 2 weeks for independent work of parents. In addition, a 2-week examination over the changes in the INFANIB tests and, depending on the results, a correction of the programme has been done. In more detail, the programme was presented in the scientific studies (Vasylenko et al., 2016).

All statistical analyses were conducted using SPSS 21.0 programme (Chicago, IL, USA). Mean ± standard deviation (M±SD) were reported. To assess the significance of the difference, in the presence a normal distribution of the results of the studies, the Student's t-test (for independent or for dependent groups) was used, and for the indicators with the distribution which was different from the normal one, there were used the Mann-Whitney U test (for independent groups) and Wilcoxon test (for dependent groups).

RESULTS

In the group of children of I degree of prematurity (DP) GA at birth 35.8 ± 1.00 weeks. The average score on the Apgar scale at the first minute of life in the group of children of I DP was 6.3 ± 0.98 points, and at the fifth minute of life was 6.9 ± 0.87 points ($p = 0.001$; $t = -4.219$), with the range of 4 to 8 points.

Among children of II DP, the average GA at birth was 33.9 ± 1.88 weeks. The analysis of the results of the assessment of the state of new-borns on the Apgar scale at the first minute of life suggests that in the vast majority of children with II DP the score was in the range of 4 to 6 (61.1% of children, moderate level of weakness), and the average results at the first minute life was 5.9 ± 1.11 points. The average figures for the fifth minute of life on the Apgar scale were 6.4 ± 0.92 points ($p = 0.005$; $t = -3.688$).

In the group of children of III DP GA at birth was 31.1 ± 3.00 weeks. The whole group of children had the Apgar score on the first minute of life in the range of 4 to 6 points, indicating moderate level of weakness. The average score on the Apgar scale in the first minute was 4.9 ± 0.74 points, and the fifth – 5.8 ± 0.42 points ($p = 0.007$; $t = -5.014$).

Among children of IV DP, the average GA at birth was 28.8 ± 1.99 weeks. The average results on the Apgar scale at the first minute of life were 4.4 ± 0.73 points, and the fifth 5.3 ± 0.50 points ($p = 0.011$; $t = -4.438$).

The obtained anthropometric indices for children of all four groups are shown in Table 1.

Based on the obtained primary data, it should be noted that in all groups of PI the degree of maturity, GA and physical development corresponded to the DP. Her are the most significant features of their dynamics.

Results of the repeated study of indicators characterizing the physical development of infants of I-IV DP for 3 months of life indicate statistically significant changes in all of the studied indices.

During the analysis of the dynamics of physical development, the following changes were recorded for 3 months in children with I DP: with a norm of BM increase of 1900 g, the average BM gain had a positive dynamics – increased by 2383.9 g or by 94.7 % to 4900.9±867.23 g ($p = 0.000$; $t = -17.495$), which corresponds to the norm; with an average increase of 11 cm in BL, the actual gain for 3 months was 13.2 cm, which is 27.7 % of the initial value ($p = 0.000$; $t = -25.850$). Similar changes were made to the value of the CH and CC – with the norm of increasing the CH by 6.3 cm (Shabalov, 2020) and the CC of 6 cm, the mean value of the CH increased by 5.15 cm and the CC by 6.2 cm, which was 15.7 % ($p = 0.000$; $t = -19.959$) and 20.1 % respectively ($p = 0.000$; $t = -38.775$).

In children of II DP with an average BM increase of 1,600 g, an increase in the average BM was observed at 1654.4 g, which is 91.8% of the initial value, to 3456.0 ± 416.71 g ($p = 0.000$; $t = -20.052$).

Table 1 The indicators of physical development of children of I-IV degrees of prematurity at the age of 0, 3, 7 and 12 months, M±SD

Studied indicators of children aged	The degree of prematurity							
	I (n=23)		II (n=18)		III (n=10)		IV (n=9)	
	Month		Month		Month		Month	
	0	3	0	3	0	3	0	3
BM, gr	2517 ± 284.36	4900.9 ± 867.23	1801.7 ± 139.08	3456.1 ± 416.71	1321.5 ± 127.06	2539 ± 179.53	895.6 ± 73.84	1584.4 ± 105.84
BL, cm	48.10 ± 2.20	60.80 ± 2.97	42.90 ± 2.49	55.20 ± 3.07	38.70 ± 3.06	51.50 ± 3.24	33.90 ± 2.15	38.70 ± 2.45
HC, cm	32.70 ± 2.03	37.90 ± 2.03	29.80 ± 1.26	35.40 ± 1.29	27.40 ± 2.47	33.30 ± 2.49	24.70 ± 1.58	30.60 ± 1.05
CC, cm	30.80 ± 1.95	37.00 ± 2.30	26.80 ± 2.16	32.90 ± 2.22	23.40 ± 2.37	29.90 ± 3.07	20.80 ± 2.39	27.50 ± 2.45
	Month		Month		Month		Month	
	7	12	7	12	7	12	7	12
BM, gr	8345.2 ± 1030.4	11013.9 ± 734.57	6230 ± 640.75	9927.8 ± 509.97	5423.0 ± 328.57	9308 ± 745.26	3548.9 ± 120.46	6905.6 ± 189.48
BL, cm	72.9 ± 3.81	81.2 ± 4.56	67.6 ± 3.40	75.4 ± 4.31	67.0 ± 3.20	79.4 ± 4.55	61.0 ± 2.45	72.8 ± 4.68
HC, cm	41.52 ± 1.54	44.63 ± 1.22	40.1 ± 1.49	43.7 ± 2.02	39.1 ± 2.90	44.8 ± 3.63	37.0 ± 1.25	42.2 ± 2.21
CC, cm	42.8 ± 1.66	47.2 ± 2.11	39.9 ± 1.98	45.7 ± 2.25	37.8 ± 3.04	46.5 ± 3.37	35.4 ± 2.40	43.9 ± 2.04

Note: BM – body mass, BL – body length, HC – head circumference, CC – chest circumference

Thus, the BM almost doubled in three months. At the norm of increasing BL by an average of 11.3 cm, the analysis of BL dynamics noted a statistically significant increase ($p = 0.000$; $t = -42.439$) of 12.3 cm, which is 28.7 % of the initial value, up to 55.2 ± 3.07 cm. With the norm of increasing the CH by 5 cm (Shabalov, 2020) and the CC on 6 cm, the results of re-measurement of the CH in children with the II DP three months after birth revealed an increase of 5.6 cm (18,8 %) to 35.4 ± 1.29 cm ($p = 0.000$; $t = -35.088$). The CC also increased statistically by 6.1 cm, which was 22.8 % of the original value, up to 32.9 ± 2.22 cm ($p = 0.000$; $t = -80.176$).

Also, there was appositive dynamics of the average results of indicators of physical development among children with III DP. With an average BM increase of 1440.0 g, we noted that the BM of children in this group increased by 1,217.5 g, which was 92.1 % of the original value, to 2539.0 ± 179.53 g ($p = 0.005$; $t = -43.389$). Thus, in children with III DP the BM almost doubled in three months, which corresponds to the norm. At the norm of increasing BL by an average of 12 cm, the statistical analysis of the values of BL set its increase by 12.8 cm (33.1 %) to 51.5 ± 3.24 cm ($p = 0.005$; $t = -32.928$). With the norm of increasing the HC on average by 5.5 cm (Shabalov, 2020) and the CC averaged 6 cm, an increase in the mean value of the HC was 5.9 cm, which was 21.5 %, and the index for three months from birth was 33.3 ± 2.49 cm ($p = 0.005$; $t = -15.895$). CC increased slightly less: the figure increased by 6.5 cm (27.8 %) to 29.9 ± 3.07 cm ($p = 0.004$; $t = -18.264$).

In children of IV DP, there is also a positive dynamic of the average results of the studied indices for 3 months of life, which had a statistically significant character. With an average BM increase of 1180 g, we noted that the BM of children in this group, in particular, the average BM index increased by 688.8 g, which was 76.9 % of the original value, to 1584.4 ± 105.84 g ($p = 0.008$; $t = -23.090$). The increase in this group of children was somewhat lower than the previous ones. With the norm of increasing the BL by an average of 10 cm, the BL increased by 33.3 % or 11.3 cm to 45.2 ± 2.45 cm ($p = 0.007$; $t = -28.151$). With the normal increase in the HC, an average of 6 cm (Shabalov, 2020) and CC in 6 cm, the average result of the HC has undergone a positive change: an increase of 5.9 cm, which is 23.9 % of the initial value, is increased to 30.6 ± 1.05 cm ($p = 0.007$; $t = -20.221$). The CC also increased: in three months the indicator was noted at the level of 27.5 cm, which is 6.7 cm,

Table 2 Neurosonography indicators in groups of children with different degrees of prematurity at the study stages

Age Results neurosonography	The degree of prematurity							
	I (n=23)		II (n=18)		III (n=10)		IV (n=9)	
	Month		Month		Month		Month	
	0	3	0	3	0	3	0	3
Insignificant expansion of the ventricular system, %	39.1	62.5	33.3	66.7	0	20.0	0	11.2
Echogenicity change of the brain tissue (or asymmetry of the lateral ventricles), %	52.5	34.8	50.0	27.8	60.0	80.0	55.6	44.4
Cysts of different localization (and/or periventricular leukomalyation), %	8.4	-	16.7	5.5	40.0	-	44.4	44.4
	Month		Month		Month		Month	
	7	12	7	12	7	12	7	12
No pathological changes, %	26.1	43.5	11.1	44.4	-	-	-	-
Insignificant expansion of the ventricular system, %	60.9	52.2	83.3	55.6	80.0	100.0	44.4	55.6
Echogenicity change of the brain tissue (or asymmetry of the lateral ventricles), %	13.0	4.3	5.5	-	-	-	55.6	44.4

Table 3 Indices of congenital and acquired diseases of the musculoskeletal system in groups with different degrees of prematurity at the study stages

Age Diseases	The degree of prematurity							
	I (n=23)		II (n=18)		III (n=10)		IV (n=9)	
	Month		Month		Month		Month	
	0	3	0	3	0	3	0	3
Congenital torticollis, %	17.4	17.4	16.7	16.7	30.0	30.0	22.2	22.2
Constitutive torticollis, %	-	30.4	-	44.5	-	40.0	-	22.2
Neurogenic torticollis, %	-	4.3	-	11.1	-	10.0	-	11.1
Congenital clubfoot, %	8.6	8.6	11.1	11.1	-	-	11.1	11.1
Flat-valgus feet, %	17.4	17.4	11.1	11.1	30.0	30.0	11.1	11.1
	Month		Month		Month		Month	
	7	12	7	12	7	12	7	12
Congenital torticollis, %	8.7	-	5.5	-	20	-	-	-
Constitutive torticollis, %	-	-	-	-	10	-	-	-
Neurogenic torticollis, %	-	-	-	-	-	-	-	-
Congenital clubfoot, %	8.6	-	11.1	-	-	-	-	-
Flat-valgus feet, %	13.1	-	11.1	-	30	-	11.1	-

or 32.2 % more than the initial value ($p = 0.007$; $t = -22.278$).

Regarding the reliability of the statistical changes in the indicators at the next stages of the study, we note that the majority of indicators significantly increased compared to the results of the previous stage. Only the HC in children with I DP has not changed statistically from the seventh to the twelfth month.

According to the results of NS in children's groups during the first examination and in three months, no cases of pathological changes were detected. In general, with the DP, the number and severity of the detected deviations increased (Tab. 2).

However, at each stage there was a positive dynamic. Thus, at the final examination, in any of the groups there were no cysts of different localization, more than 40% of children in groups with the I and II DPs already did not have pathological changes. However, children of III and IV DPs showed no cases of pathological changes during the final examination too.

According to the analysis of the results of the medical examinations, congenital and acquired pathologies of different genes, which during the study period and the course of PT had positive dynamics, were identified (Table 3).

It should be noted that at the time of the first

survey, the largest percentage in the groups had a congenital torticollis, and in the third month the constitutive torticollis. Congenital clubfoot is not detected only in children with III DP.

DISCUSSION

The analysis revealed significant differences between the children of the studied groups with different DP. The greatest indicators of physical development are noted in children of I DP, and the worst – in IV DP. During the first year of life, children of all groups experienced significant dynamics in the main indicators of physical development, but the final values of mass and BL remained the same. All groups, with the exception of IV DP, almost doubled the BM for the first three months of life. But already in the interval between the 3 and 7 months, the group of IV DP had the largest relative increase in mass.

More complex lesions of the brain were detected among children of IV DP according to NS results. We draw attention to the fact that only in this group there were no statistically improvements of the NS results in 3 months.

Congenital torticollis at the first examination was the most common in children of III DP, and the smallest percentage in the group of II DP. Constructive torticollis, with its first definition for 3 months of life, had the lowest frequency in children with the most severe premature birth - IV DP. At the time of the final examination, in all groups of children, there was no curvature, congenital clubfoot and flat-valgus feet, resulting from timely and rational use of PT means.

The theoretical basis for PT intervention is knowledge of neonatal behaviour, the importance of parental competence, and theories of motor development, including neuroscience and body phenomenology (Øberg et al., 2012; Freitas et al., 2021; Youn et al., 2021).

Motor function is related to the development of postural control which is necessary to transfer and modify body weight distribution for appropriate functional movement, communication and social interaction. To have postural control is then about maintaining a bodily position over time, regaining postural stability after perturbations, managing changes between different postures, and integration of postures into locomotion and exploration. Interventions that optimize postural control and selective movement in preterm infants may therefore be important in reducing the degree of delayed motor development (Øberg et al., 2012; Fuentefria et al., 2017; Zuccarini et al., 2020).

The human brain in infancy is highly plastic and there is an active growth of dendrites and formation of synapses. Motor skills may be highly influenced by early intervention because the motor pathways forming the corticospinal tracts already show mature myelin at term age and myelination may be activity-dependent. There is some evidence that recovery from central nervous system injury in infants can be understood both by new growth of motor neurons and creation of new synapses. Moreover, that part of the brain is not yet developed for specific tasks and may be developed for other uses than were originally intended. Of these insights about brain plasticity it is suggested that early-targeted customized individual intervention could be of great importance to the development of movement quality and function of preterm children (Øberg et al., 2012; Schadl et al., 2017)

In their randomized study, Øberg et al. (2012) noted that the use of physical therapy programs as a permanent component is an effective therapeutic tool and preventive measure in the long-term process of psychomotor functions formation and physical development of a premature infant. The authors present an individually tailored health promotion physiotherapy program designed for premature babies to improve their motor development. The intervention program is based on modern theoretical foundations and includes aspects of previously successful interventions, such as the importance of regulating infant behaviour and parental competence in social interaction.

Luo et al. (2013) have distinguished a predictive validity of INFANIB at the age of 3 – 4 and 6 – 7 months and proved the significant sensitivity, peculiarity, and positive predictive significance of this method for the assessment, development, and correction of physical therapy methods applied to premature infants.

It should be noted that there is limited data on the effect of PT on improving motor development in premature infants. Interventions designed to stimulate the development of these infants have been mixed, and there are several studies that report a significant impact of early intervention on motor development (Øberg et al., 2012; Lademann et al., 2021; Liu et al., 2021). Exploring an approach in which therapy is tailored to the individual needs of

a premature baby can provide knowledge on how to improve motor development in these infants.

The duration of the program is due to the fact that the first year of life is the most difficult and dynamic period in the development of premature babies. In this period of life, physical therapy has the most productive effect on the physical and psychomotor development of this category of children, and the use of a staged evaluation according to INFANIB scale makes it possible to establish and evaluate changes in motor functions.

A small number of probands was due to the necessity to implement a single program of complex physical therapy, appropriate for all. The absence of a control group was due to the lack of a unified approach in the physical therapy of premature babies in the first year of life in Ukraine. In fact, the work reflects the creation of an algorithm for physical therapy of premature infants in the first year of life, based on the principles of follow-up observation and a multisystem approach.

CONCLUSIONS

Despite the significant dynamics of anthropometric indicators during the first year of infants' life, the final meanings of mass and body length remained different in the group. Torticollis, congenital clubfoot and flat-valgus feet have not been identified at the final examination, which should be considered as a result of timely and rational use of PT means.

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