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ORIGINAL PAPER

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Diversification of results of orientating questionnaire of motoric and psycho-social development in regard to the level of educational maturity (school readiness) in prematurely born children

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Abstract

Introduction. Currently, one of the most common problems in neonatology is the occurrence of distant consequences of prematurity. In infants, toddlers, and children with special problems, there can be disorders in psychomotor development and in growing, and later also intellectual and cognitive disorders. Pre-school and early-school age is particularly significant in the lives of prematurely born children. In this period, usually beside the stage of somatic growth, there is intensive physical and mental development and intellectual disorders may appear.

Aim. Assessment of preterm training in motor skills and psychosocial development

Materials and methods. The research group consisted of 61 prematurely born children aged 5-8. Perinatal interviews were collected and basic anthropometric measurements were performed.

Results. There is no statistical significance between questionnaire results in particular areas of development, summary, age, gender, subsequent pregnancies, number of fetuses, delivery term and the type of delivery.

Conclusions. The Apgar disinfectant scale differentiates the results of the indicative questionnaire on motor development research. The results of the study confirm the prognostic importance of the Apgar scale in terms of development.

Keywords. development of premature babies, orientation study, school readiness

Introduction

Prematurity is defined as delivery before 37th week of gestation. Premature birth creates medical, social and family problems. A premature newborn requires intensive medical care and nursing. The effects of premature delivery as well as all the circumstances surrounding such situations are felt for many years to come. Thirty percent of children born before the 29th week of pregnancy who survive present neurological disorders, learning difficulties as well as hearing and sight impairment.[1]

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The prevalence of prematurity in highly developed countries has been established at the rate between 5-10%. According to the most recent data, the rate of prematurity in Poland amounts to 6.3% while the number of premature children born with very low birth weight ranges from 3,500 to 4,000 annually. In the USA, the rate of prematurity is higher and amounts to about 11.5%.[2] Therefore for some time epidemiological prematurity trends observed in Poland seem to be similar to those in the USA and some European countries. The percentage of death rate of infants has been slightly decreasing while the newborns still constitute the largest group among them.[3]

In the available Polish and foreign literature, the prognostic value of Apgar scale values for motor and social development of premature babies is widely described.[4] The research results show that intensity of distant after-effects of prematurity such as: increased incidence, developmental disorders that are inversely proportional to gestational age and immaturity degree at birth. Premature children frequently require long lasting treatment. Therefore, Children's Coordinated Care Program has been recently introduced in our country and it covers the following: integrated neonatal care, multispecialized pediatric care according to individual needs and rehabilitation programs for children up to 3 years of age. Children diagnosed with severe retardation or incurable life-threatening disease acquired during perinatal period or at delivery qualifies for this program.[5]

Aim

Determination of the following parameters: age, gender, occipito-frontal circumference, and elements of perinatal interview differentiate the results of orientating questionnaire of motoric and psycho-social development in regard to the level of educational maturity (school readiness) in prematurely born children.

Material and method

The research group consisted of 61 prematurely born children aged 5-8. The group was functionally homogeneous – all children underwent one year long pre-school program. The large age gap happened due to earlier enrollment of some of children to the first grade as well as one year long postponed enrollment to compulsory education. ($\bar{x}$=6.38 years old, Me=6 lat, s=0.73). The group consisted of 29 (48%) boys and 32 (52%) girls.

The research was approved by Bioethics Committee of Medical Faculty of The University of Rzeszów (the first resolution 7/12/2012, the last one 6/2/2017). The research was conducted between 2015-2016 at the Physiotherapy Institute of The University of Rzeszów and the Laboratory of Innovative Anthropometric Methods in the Innovative Center of Medical and Natural Sciences of the University of Rzeszów..

The research was consistent with health balance sheets and conducted in accordance with generally accepted rules and standard proceedings included in health balance of children undergoing a one year long pre-school program. Perinatal interviews were collected and basic anthropometric measurements were performed. The technique of anthropometric measurements was based on international methods applied in anthropology. The following anthropometric features were measured: weight – w, height – h, occipito-frontal circumference – ofc, with the use of medical scale (kg), anthropometer (cm), anthropometric tape (cm). Proportion coefficient was calculated: Quetelet II weight – hight ratio (kg/m^2 WQ2, Body Mass Index, BMI).[6,7]

An orientating questionnaire of motoric and psycho-social development in regard to the level of educational maturity (school readiness) in prematurely born infants was conducted. Traditionally, orientation evaluation of motoric and psycho-social development conducted during health balance sheet in this age group is obtained on the base of data from interview, analyses of questionnaire filled up by the parents, conversations and child observation. Questionnaire was elaborated by M. Jaroszyńska- Szymczuk in accordance with J. L. Black: School readiness. Pediatric Basic, 1990, 55, 2, published in "Prophylactics in pediatrics", edited by Barbara Wojnarowska WL PZWL 1998, s. 301. The questionnaire is filled in by the parent. If the number of answers YES or cumulation of YES answers in some areas is predominating, the child should be referred to Psychological-Pedagogical Out-patient Clinic (Table 1). For the purpose of this paper, the scoring system was assigned to the questionnaire (Table 1).

The dependencies between age, gender, BMI, occipito-frontal circumference, and elements of perinatal interview differentiate the results of orientating questionnaire of motoric and psycho-social development in regard to the level of educational maturity (school readiness) were statistically analyzed. Mann-Whitney non parametric test was used to evaluate the differences in an average level of measurable characteristics in two populations while Anova Kruskal-Wallis not parametric test was used to evaluate the differences in an average level of measurable characteristics in more than two populations. The correlation of two variables not complying with normal distribution criterion was elaborated with Spearman rank-based correlation coefficients. The statistical significance was assumed to be $p < 0.05$.

Based on the perinatal interview, it was established that the children were born from pregnancies of various order (Table 2A), with different number of fetuses (Table 2B), premature (Table 2C), by C-section or by power of nature (Table 2D). The infants were delivered healthy with different birth weight (Table 2E, 2F).

Table 1. Questionnaire, scoring

Answer	YES	NO	Sometimes YES, sometimes NO
Interpretation of an answer	Adverse	Desirable	Intermediate
Scoring	0	1	0.5

Table 2. The characteristic of group of premature children ready to enroll school based on gathered data (part I)

Perinatal Interview		
A. Order of pregnancies	**N**	**%**
The first pregnancy	31	51
The second pregnancy	15	25
The third pregnancy	5	8
The fourth pregnancy	5	8
The fifth pregnancy	2	3
The sixth pregnancy	3	5
B. Number of fetuses	**N**	**%**
Single pregnancy	39	64
Twin pregnancy	13	21
Triplet pregnancy	9	15
C. Delivery time (weeks)	**N**	**%**
24	2	3
25	0	0
26	4	7
27	6	10
28	8	13
29	1	2
30	10	16
31	5	8
32	23	38
33	0	0
34	1	2
35	1	2
D. The way of delivery	**N**	**%**
By power of nature	10	16
C-section	51	84
E. Apgar scale evaluation [points]	**N**	**%**
0–3	9	15
4–7	39	64
8–10	13	21
F. Birth weight [g]	**N**	**%**
Under 750	3	5
750–1000	10	16
1000–1500	21	34
1500–2500	26	43
Over 2500	1	2

In the perinatal period, the researched, premature children were burdened by numerous and unfavorable perinatal events (Table 3A) and hearing impairment risk factors (Table 3B). The number of unfavorable perinatal events (Table 3A) and hearing impairment risk factors (Table 3B) were calculated. Statistical scores describing BMI (Table 3C), ocf (Table 3D) and results of motoric and psycho-social development with the use of questionnaire (Table 3E) were calculated. On the basis of the six-year balance and the interview with parents of children born prematurely in the examined group, prevalence of chronic diseases in the population was found (recurrent respiratory infections, bronchial asthma, Mpdz, refractive error), congenital malformations in 26 people (inguinal hernia, survived arterial duct, lesion labia).

Table 3. The characteristic of group of premature children ready to enroll school based on gathered data (part II) and anthropometric parameters

Perinatal Interview				
A. Combined number of unfavorable perinatal events (one event scores 1 point): respiratory failure, respiratory distress syndrome: bronchopulmunary displasia, congenital pneumonia, pneumonia, pneumothorax, respiratotheraphy, passive oxygen therapy, hyperbilirubinaemia, anemia, thrombocytopenia, leukopenia, bleeding from respiratory, gastrointestinal, tract/cardiac tamponade, Rhesus incapability in main groups, blood or blood derivative transfusion, exchange transfusion, hypoxic ischemic encephalopathy periventricular leukomalacia, intraventricular hemorrhage of I-IV degree, epilepsy, convulsions different than in epilepsy, apnea, retinopathy of prematurity, patent ductus arteriosus, TORCH infections, intrauterine infections, sepsis, purulent menangitis, encephalitis, bacterial infection of digestive system, urinary tract infection, necrotizing enterocolitis, gastro- esophageal reflux, hypoglycemic, hypocalcemia, osteopenia of prematurity, intravenous administration of drugs, parenteral feeding, enteral feeding, procedure in general anesthesia.				
$\overline{x}$	Me	Min	Max	*s*
11.93	12.00	0	26	5.75
B. Total number of fulfilled criterions of increased risk of hearing impairment (1 criterion scores 1 point): hearing impairment running in the family, virus illnesses (measles, cytomegaly, toxoplasmosis, influenza) past by mothers in the first half of pregnancy, ear, neck and head abnormalities, high level of bilirubin in newborn >20mg% (with body weight 2500g) and over 15 % mg% with body weight under 2500 g., transfusion, small body weight (<1500 g.), bacterial meningitis, 0-3 Apgar points in the first 5 minutes, 0-6 Apgar points in 10 minutes, lack of spontaneous breath for 10 minutes or hypotension in the first two hours, cardio-respiratory failure (mechanical ventilation longer than 10 days), ototoxic medicine (aminoglycosides, duretics), the features of genetic syndrome that can coexist with sensorineural or conductive hearing loss.				
$\overline{x}$	Me	Min	Max	*s*
2.09	2.00	0	5	1.39
A. Body Mass Index BMI [kg/m^2]				
$\overline{x}$	Me	Min	Max	*S*
15.36	15.26	10.46	27.80	2.43
B. Occipito-frontal circumferrence ofc [cm]				
$\overline{x}$	Me	Min	Max	*sS*
51.59	51.50	42.00	58.50	2.72

C. Questionnaire result. scoring

Child functioning (Number of questions)	$\overline{x}$	Me	s	Min	Max
Big motorics (4)	3.24	3.50	0.92	0.00	4.00
Small motorics (3)	2.39	2.50	0.70	0.50	3.00
Hand – eye coordination (3)	2.77	3.00	0.56	1.00	3.00
Speech (6)	4.67	5.00	1.38	1.00	6.00
Spatial orientation. awareness of own body (1)	0.92	1.00	0.23	0.00	1.00
Memory(3)	2.19	2.00	0.78	0.00	3.00
Attention. activity (4)	1.86	2.00	1.17	0.00	4.00
Emotional – social maturity (4)	2.77	3.00	1.01	0.50	4.00
Summary (28)	20.80	20.50	4.20	9.50	28.00

There is not statistical significance between questionnaire results in particular areas of development, summary, and age (Table 4A), gender (Table 4B), subsequent pregnancies (Table 4C), number of fetuses (Table 4D), delivery term (Table 4E), the way of delivery (Table 5A), the sum of unfavorable events during perinatal period (Table 5D), the sum of fulfilled criterions of increased risk of hearing impairment (table 5E), BMI (Table 6A) and ocf (Table 6B).

There is statistical significance between postnatal Apgar scale evaluation and summary determined with the use of questionnaire (p=0.013), results in the following areas: big motorics (p=0.009), hand-eye coordination (p=0.004), memory (p=0.014) (Table 5). There was not statistical significance between remaining areas and postnatal Apgar scale evaluation. The statistical significance was obtained only in relation between birth weight and hand-eye coordination (p=0.039) (Table 5C). The lower Apgar scale evaluation gave lower results in areas of big motorics (p=0.009) (Table 6D), memory (p=0.014) (Table 7B) and summary (p=0.013) (Table 7C). In all those cases the difference between children born with ill health (Apgar 0-3 points), medium (Apgar 4-6 points) and good health (Apgar 8-10 points) is

Table 4. Statistical analysis of results

A. Questionnaire results versus age (with Spearman rank-based correlation coefficients)	R Spearman	p
Big motorics	0.11	0.381
Small motorics	0.08	0.535
Hand-eye orientation	0.14	0.277
Speech	0.22	0.087
Spatial orientation, awareness of own body	0.08	0.517
Memory	0.18	0.173
Attention, activity	0.16	0.206
Emotional-social maturity	0.10	0.466
Summary	0.23	0.072
B.Questionnaire results versus gender (Mann-Whitney test)	Z	
Big motorics	0.09	0.928
Small motorics	0.98	0.327
Hand-eye orientation	0.53	0.59
Speech	0.43	0.664
Spatial orientation, awareness of own body	-1.39	0.164
Memory	0.11	0.911
Attention, activity	0.89	0.374
Emotional-social maturity	-0.87	0.383
Summary	0.43	0.670
C. Questionnaire results versus order of subsequent pregnancies (with Spearman rank-based correlation coefficients)	R Spearman	p
Big motorics	0.04	0.755
Small motorics	-0.21	0.111
Hand – eye coordination	-0.00	0.99
Speech	-0.06	0.672
Spatial orientation, awareness of own body	-0.02	0.896
Memory	0.18	0.157
Attention, activity	-0.01	0.912
Emotional – social maturity	-0.04	0.777
Summary	0.02	0.885
D. Questionnaire results versus number of fetuses (with Spearman rank-based correlation coefficients)	R Spearman	p
Big motorics	-0.04	0.767
Small motorics	0.15	0.243
Hand-eye coordination	-0.17	0.191
Speech	-0.15	0.257
Spatial orientation, awareness of own body	-0.10	0.457
Memory	-0.11	0.399
Attention, activity	-0.11	0.421
Emotional-social maturity	-0.11	0.406
Summary	-0.09	0.477
E. Questionnaire results versus term of delivery (with Spearman rank-based correlation coefficients)	R Spearman	p
Big motorics	-0.04	0.759
Small motorics	-0.10	0.456
Hand-eye coordination	0.00	0.990
Speech	-0.20	0.127
Spatial orientation, awareness of own body	-0.14	0.300
Memory	-0.60	0.627
Attention, activity	-0.04	0.757
Emotional-social maturity	-0.16	0.226
Summary	-0.13	0.320

Table 5. Statistical analysis of results

A. Questionnaire results versus the way of delivery (Mann-Whitney test)	U	p
Big motorics	221.5	0.520
Small motorics	199.0	0.284
Hand-eye coordination	246.5	0.870
Speech	240.0	0.781
Spatial orientation, awareness of own body	206.5	0.350
Memory	207.0	0.360
Attention, activity	222.0	0.532
Emotional – social maturity	250.0	0.931
Summary	253.5	0.977
B. Questionnaire result versus postnatal Apgar scale evaluation (Kruskal-Wallis test)	H	p
Big motorics	9.240	0.009
Small motorics	1.091	0.579
Hand-eye coordination	11.022	0.004
Speech	1.687	0.401
Spatial orientation, awareness of own body	3.913	0.141
Memory	8.474	0.014
Attention, activity	5.343	0.069
Emotional-social maturity	0.002	0.998
Summary	8.610	0.013
C. Questionnaire results versus birth weight (Kruskal-Wallis test)	H	p
Big motorics	0.494	0.920
Small motorics	2.727	0.435
Hand-eye coordination	8.358	0.039
Speech	1.641	0.650
Spatial orientation, awareness of own body	2.625	0.453
Memory	0.710	0.870
Attention, activity	3.083	0.378
Emotional-social maturity	2.338	0.505
Summary	2.512	0.473
D. Questionnaie results versus combined number of unfavorable events in perinatal period (with Spearman rank-based correlation coefficients)	R Spearman	p
Big motorics	0.03	0.795
Small motorics	-0.01	0.940
Hand-eye coordination	-0.22	0.093
Speech	0.09	0.485
Spatial orientation, awareness of own body	0.04	0.766
Memory	0.03	0.836
Attention, activity	-0.09	0.473
Emotional-social maturity	0.13	0.319
Summary	-0.00	0.978
E. Questionnaire results versus the sum of fulfilled criterions of increased risk of hearing impairment (with Spearman rank-based correlation coefficients)	R Spearman	p
Big motorics	-0.12	0.337
Small motorics	-0.17	0.191
Hand-eye coordination	-0.24	0.063
Speech	0.04	0.768
Spatial orientation, awareness of own body	-0.12	0.375
Memory	-0.09	0.500
Attention, activity	-0.18	0.176
Emotional-social maturity	-0.10	0.441
Summary	-0.19	0.147

Table 6. Statistical analysis of results

A. Questionnaire results versus BMI (with Spearman rank-based correlation coefficients)	R Spearman	p
Big motorics	-0.19	0.133
Small motorics	-0.04	0.771
Hand-eye orientation	-0.02	0.873
Speech	-0.17	0.192
Spatial orientation, awareness of own body	-0.06	0.663
Memory	-0.20	0.126
Attention, activity	-0.16	0.225
Emotional-social maturity	-0.05	0.681
Summary	-0.20	0.121

B. Questionnaire results versus ocf (with Spearman rank-based correlation coefficients)	R Spearman	p
Big motorics	0.052	0.685
Small motorics	-0.102	0.429
Hand-eye coordination	0.146	0.261
Speech	0.054	0.678
Spatial orientation, awareness of own body	0.056	0.663
Memory	0.199	0.123
Attention, activity	0.213	0.098
Emotional-social maturity	0.007	0.955
Summary	0.141	0.279

C. Hand-eye coordination versus birth weight

Variable	Birth weight [g]	N	$\overline{x}$	Me	Min	Max	*s*
Hand-eye coordination [points]	…–750	3	2.00	2,00	1,00	3,00	1,15
	751–1000	10	3.00	3,00	3,00	3,00	0,00
	1001–1500	21	2.62	3,00	1,00	3,00	0,76
	1501– …	27	2.89	3,00	2,00	3,00	0,29

Dependent variable: hand-eye coordination [points]	Value of bilateral comparison (Kruskal -Wallis test) H=8.358. p=0.039)			
	Independent variable: birth weight [g]			
	….–750	751-1000	1001-1500	1501…..
	R: 15.333	R: 36.500	R: 28.881	R: 32,352
…..-750		0.421	1.000	0,691
751-1000	0.421		1.000	1,000
1001–1500	1.000	1.000		1,000
1501……	0.691	1.000	1.000	

D. Big motorics versus Apgar scale postnatal evaluation

Variable	Apgar scale postnatal evaluation	N	$\overline{x}$	Me	Min	Max	*s*
Big motorics [points]	0–3 points	9	2.44	2,00	1,00	3,50	0,88
	4–7 points	39	3.37	3,50	0,00	4,00	0,86
	8–10 points	13	3.38	4,00	2,00	4,00	0,89

Dependant variable: big motorics [points]	Value of bilateral comparison (Kruskal-Wallis test) H = 9.240. p = 0.009		
	Independent variable: Apgar scale postnatal evaluation [points]		
	0–3	4–7	8–10
	R: 15.278	R: 33.256	R: 35.115
0–3		0.019	0.030
4–7	0.019		1.000
8–10	0.030	1.000	

Table 7. Statistical analysis of results

A. Hand-eye coordination versus postnatal Apgar scale evaluation							
Variable	Apgar scale postnatal evaluation	N	$\overline{x}$	Me	Min	Max	*s*
Hand – eye coordination [points]	0–3 points	9	2.17	2,00	1,00	3,00	0,87
	4–7 points	39	2.40	3,00	1,00	3,00	0,37
	8–10 points	13	2.85	3,00	1,00	3,00	0,55
Dependent variable: Hand – eye coordination [points]	Value of bilateral comparison (Kruskal-Wallis test) H = 11.022. p = 0.004)						
	Independent variable: postnatal Apgar scale evaluation [points]						
	0–3	4–7			8–10		
	R: 18.889	R: 32.833			R: 33.885		
0–3		0.101			0.154		
4–7	0.101				1.000		
8–10	0.154	1.000					
B. Memory versus postnatal Apgar scale evaluation							
Variable	Apgar scale postnatal evaluation	N	$\overline{x}$	Me	Min	Max	*s*
Memory [points]	0–3 points	9	1.61	1,50	1,00	2,50	0,49
	4–7 points	39	2.24	2,50	0,50	3,00	0,76
	8–10 points	13	2.42	2,50	0,00	3,00	0,84
Dependent variable: Memory [points]	Value of bilateral comparison (Kruskal-Wallis test) H = 8.474. p = 0.014)						
	Independent variable: postnatal Apgar scale evaluation [points]						
	0–3	4–7			8–10		
	R: 16.444	R: 32.205			R: 37.462		
0–3		0.049			0.019		
4–7	0.049				1.000		
8–10	0.019	1.000					
C. Summary result versus postnatal Apgar scale evaluation							
Variable	Apgar scale postnatal evaluation	N	$\overline{x}$	Me	Min	Max	*s*
Summary result [points]	0–3 points	9	17.56	17,50	13,00	23,00	2,90
	4–7 points	39	21.09	21,50	9,50	25,00	4,25
	8–10 points	13	22.19	20,50	17,50	27,00	3,89
Dependant variable: Summary result [points]	Value of bilateral comparison (Kruskal-Wallis test) H = 8.610. p = 0.013)						
	Independent variable: postnatal Apgar scale evaluation [points]						
	0–3	4–7			8–10		
	R: 15.444	R: 32.705			R: 36.654		
0–3		0.026			0.018		
4–7	0.026				1.000		
8–10	0.018	1.000					

especially noticeable Such differences were not noticed between postnatal Apgar scale evaluation, birth weight and area of hand-eye coordination (Table 7A, table 6C).

Discussion

Children born prematurely are not considered homogeneous group due to various factors such as birth weight of gestation time. Serious neuro-developmental disorders as severe as OUN ones are not frequent, however further development of children prematurely born depends on mutual relation between the immaturity level, existing complications and neurological malfunctions (bronchopulmonary dysplasia, retinopathy of prematurity, intraventricular hemorrhage, periventricular leukomalacia) as well as environmental and socio-economic factors.[8]

In the light of above, it can be concluded that premature children are more prone to disorders in proper functioning and development. Those disorders can affect both psychical and physical child's development and they can produce the disorders of various degree: from almost unnoticeable to very recognizable ones.[9] Izabela Marczykowska and Wioletta Koczaja-Styka in their paper described risk factors and consequences of prematurity.[10] The results of multiannual observations of extremely immature newborns published by world neonatological centers show the significance of long-term observation of this group of patients.[11]

The motoric and psycho-social development in regard to school readiness in 61 premature children aged 5-8 was evaluated in presented own research. Statisti-

cal significance was obtained between postnatal Apgar scale evaluation and summary with the use of questionnaire in the range of the following areas: big motorics, hand-eye coordination, memory. The lower Apgar scale evaluation, the lower result in big motorics (p=0.013) (Table 7C). There are many publications concerning school readiness of premature children in various areas. Lina Brostrom et al. conducted the evaluation of 80 premature children, age 6, nor diagnosed with Cerebral Palsy. In order to perform movement evaluation the authors used simplified version of neurological examination Touwen Infant Neurological Examination as well as Movement Assessment Battery for Children Second Edition (MABC-2), Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV), the Strengths and Difficulties Questionnaire (SDQ) and Five to Fifteen Questionnaire. After the analyses of the results, the researchers concluded that despite absence of Cerebral Palsy, premature children are prone to small neurological disorders that can disrupt motorics, cognitive abilities and behavior.[12]

Hsu CT et al. evaluated the correlation between the birth weight and psycho-motoric development of premature children in Taiwan. The authors researched 1791 premature children born 2007-2011 with birth weight under 1500g. To evaluate psycho-development they applied Bayley Scales of Infant Development-II (BSID-II while the rest of data such as weight, occipito-frontal circumference, gender, co-existing illnesses were derived from medical documentation. The research proved the relation between lower birth weight corrected in age of 6, 12 and 24 months and low neuro-developmental results. What in turns, confirms the influence of unfavorable factors that can disrupt and affect motoric and psycho-social development of premature children.[13]

Multiplicity of complications due to prematurity has to be considered the major negative factor. The most frequent are: Cerebral Palsy, sight, hearing and speech disorders, mental retardation, retinopathy of prematurity (Tab 3A) which significantly influence further motoric and psycho- social development of a child.[14] Personal questionnaire (Table 3A) confirmed ballast of unfavorable perinatal events and risk of hearing loss (Table AB). Ream MA et al. observed 145 premature children beginning the compulsory education and compared them with their full-term peers. The authors describe consequences and after-effects of premature delivery emphasizing the occurrence of neurological disorders in premature children and their correlation with later cognitive and social ones.[15]

Our research confirms statistical significance between big motorics, memory, summary and postnatal Apgar scale evaluation as well as between birth weight and hand-eye coordination. The lower the Apgar scale evaluation, the lower result in above mentioned areas. This relation confirms the relevance of both Apgar scale and birth weight in the context of course and psycho-somatic development in researched group of children. Oudgenoeg-Paz O. et al. widely analyzed literature about prematurity influence, low birth weight on the level of motorics and cognitively in premature children. The conclusions confirm the significance of level of motoric development in the first year of life and later cognitive abilities in premature children with low birth weight.[16]

Magdalena Chrzan-Dętkoś and Marta Bogdanowicz researched 99 premature pre-school children, hospitalized after birth in ICU in two Gdańsk hospitals in order to evaluate their psycho-kinetic development. The children were delivered in 32 week (in average), an average birth weight was 1776 g., an average Apgar scale evaluation – 5,56 points. The authors used Columbia Mental Maturity Scale, chosen sub-test of Terman-Marrill Scale. To evaluate cognitive development they applied Orientative DSM Scaled for Girls and BOYD elaborated on the base of CBCL 1,5-5 Questionnaire. The results indicate bigger cognitive and emotional difficulties of premature children. Those difficulties were especially noticeable in children born before 32nd week of pregnancy, with very small birth weight (1500g.).[17] This research can be also useful in assessment of school readiness.

Perez-Rochei et al. performed the analyses of premature children in regard to school maturity. They researched children with low birth weight and subsequently assessed their abilities to learn at school. They conducted the full ophthalmological examination and used standard visual test of perceptive abilities as well as visual abilities test. The parents filled the questionnaire concerning the learning results of children. The authors observed that visual deficiencies and motoric disorders create significant difficulties in early school learning process of math and reading for premature children.[18]

Hand-eye coordination enables children to perform activities requiring the simultaneous usage of hand and eye. Such coordination is necessary to perform various activities such as: writing, drawing, physical exercises. In pre-school and early school children the disorders in this area are shown by small precision of movements and difficulties with performing simple orders. Bayley Motor Scale, Peabody Development Motor Scale, Griffiths Mental Development Scales are used in pediatrics to evaluate this coordination.[19]

Premature, pre-school children with low birth weight show the disorders in hand-eye coordination, what was confirmed in our research (Table 6C) by analyses of questionnaire and research results (Table 3E).

Surka et al. evaluated and compared full-term peers with Cerebral Palsy children with spastic hemiplegia of

prematurity in regard to hand-eye coordination. The research was conducted by reaching and garbing some object setup in one position and then placing it in proper place and proper position. Visual reactions were recorded with the use of device following eyes mounted on the head of the patient while movements of shoulders with the help of movement recorder (120Hz). The researchers noticed the delayed time of perception during planning phase and movement performance in regard to control group. Cerebral Palsy children had higher frequency of eyeball movement, longer reaction time (RT and movement time (MT). In spite of the fact that the researched group consisted of Cerebral Palsy children with spastic hemiplegia of prematurity, it does not negatively influence the hereby discussion, as it is well known that those children can attend regular school. The authors, however, emphasize the role of therapy focusing on an improvement of hand-eye coordination, as it can increase their motoric efficiency.[20,21]

Ribeiro CD et al. observed and described hand-eye coordination disorders in premature children aged 1-3 with low birth weight and low Apgar scale evaluation. The authors applied own protocol with socio-economical classification and Denver Developmental Screening Test (DDST-II). There was significant correlation between prematurity, low Apgar scale, birth weight and adaptive and social opportunities, which were considerably lowered.[22]

Results and observations described above derived from own research and researches done by other authors confirm the necessity to conduct screening tests of premature, pre-school children to conduct early diagnosis and compensate developmental disorders what will make school preparation process better and more efficient.

Conclusions

1. The results of the questionnaire on the indicative study of motor and psychosocial development in terms of school readiness are differentiated by the post-natal Apgar score (in the areas of child's functioning – high motor skills, visual-motor coordination, memory and total score), as well as birth weight (in terms of eye-and-eye coordination).
2. The results of the study confirm the prognostic importance of the Apgar scale as to the psychomotor development in the examined group of children.

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