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COMPARATIVE ANALYSIS OF THE PHYSICAL DEVELOPMENT AND ABILITIES OF PUPILS WITH DAMAGED AND PUPILS WITH NORMAL SENSE OF HEARING

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Abstract. *A JZFK batteri of tests and specific battery of tests for evaluating physical abilities were applied on the sample of 48 pupils with damaged and 56 pupils with normal hearing. According to the results, it could be concluded that pupils with damaged hearing had significantly worse results in the tests for evaluating: balance, speed of running and ehplosive leg strength in comparrison with healthy pupils. In other tests, differences did not reach the level of statistcal sigifcance.*

Key words*: Pupils, Physical abilities, Vestibular apparatus, Damaged, Hearing, Physical education, Morphological dimensions*

INTRODUCTION

Damaged sense of hearing is a disturbance which can be caused by a number of patogenous factors during the prenatal, perinatal and post-natal period. These can leave minor or major changes on the auditive system of the following types:

- conductive (as a consequence of disturbance on the level of external ear canal of the middle ear),
- perceptive (the disturbance appears as a consequence of damage on the level of internal ear, ear passages and central acoustic spheres).

Sense of hearing makes it possible for a man to develop the most complex psychophysiological functions of speech and, together with them, the development of thought up to the highest levels of abstraction. When one kind of the hearing perceptions is missing, the integrated functioning of all other senses is changed, so that it is impossible to speak of a normal development of a child. Although other senses like senses of sight and touch have a compensatory part, they are unable to compensate completely

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for the loss of hearing. Damage of the internal ear can significantly influence balance keeping positions, as well as coordination of movement, since it is the anatomical place where the most important receptors for maintaining balance are situated. All these factors can influence the integrated development of a child`s personality, as well as the development of some physical abilities in a negative way .

FORMER RESEARCH

Few researches have been done in this country the aim of which was to determine the morphological characteristics and physical abilities of the children with damaged hearing.

S. Stefanović (1960) researched on some morphological characteristics and functional abilities of deaf-mute pupils in schools for disabled children at Svetozarevo and Zemun and compared the results with the same characteristics of the children with normal hearing. In order to determine the morphological characteristics, she took body height and weight and thorax circumference and, as a measure of functional capacities, vital capacity. On the basis of obtained results it was established that there was no significant difference neither in morphological characteristics nor in functional abilities between deaf and hearing children, although vital capacity of deaf children was slightly lower.

Z. Žikic (1975) conducted a research with the aim to establish some physical abilities of children with damaged hearing in order to plan and improve classes of physical education with those children adequately. In his research he applied the following battery of tests:

- vital lung capacity
- balance test
- 30 meter run
- flexions on a horizontal bar
- push-ups
- lie-sit-ups
- lie-lean backwards

The results of this research showed that children with damaged hearing were not behind their hearing peers in all physical abilities, but only in balance, speed of running and vital lung capacity.

The problem of the mentioned researches lies in the fact that insufficient batteries of tests in order to determine morphological characteristics and physical abilities of the pupils were applied, so that relevant conclusions based on the results could not be reached.

SUBJECT OF RESEARCH

The subject of this research were morphological characteristics and physical abilities of the children with damaged hearing.

The aim of the research was to:

- determine morphological characteristics of the children with damaged hearing and compare them with the corresponding morphological characteristics of their peers with

normal hearing,

- to determine physical characteristics of the children with damaged hearing and compare them with the corresponding physical characteristics of their peers with normal hearing.

HYPOTHESIS

According to the subject and the aim of research, the following hypothesis were established.

- h1. Significant differences in morphological characteristics of the children with damaged hearing and their peers with normal hearing are not expected,
- h2. Significant differences in physical abilities between children with damaged hearing and their peers with normal hearing are not expected, except in the abilities which are mainly controlled by the mechanisms for synergic regulation and regulation of tonus.

SAMPLE

Research was done on the sample of fifth- and sixth-grade pupils with damaged hearing from schools "Silvije Kranjčević" in Belgrade and "Radivoj Popovic" in Zemun and pupils with normal hearing from primary school "Branko Copic " in Belgrade. In the subsample of children with damaged hearing there were 28 fifth-grade children (17 boys and 11 girls) and 19 sixth-grade pupils (10 boys and 9 girls).

In the subsample of children with normal hearing there were 56 pupils, 30 of which attended fifth grade (17 boys and 13 girls) and 26 attended sixth grade (13 boys and 13 girls).

VARIABLE SAMPLE

Technique of testing was used in this research. Two batteries of tests were applied.

a) General battery of tests of the Yugoslav institute for physical culture (S. Ivanić) which included:

- height
- weight
- flexions in mixed hang
- bouncing a ball against the wall
- long jump
- throwing a medicine-ball (4 kg)
- 30 m run

b) Apart from this battery, a battery of specific tests used to establish the level of physical abilities which are mostly controlled by the mechanisms for synergic regulation and the regulation of tonus

- agility in the air
- hand tapping
- standing on one foot with closed eyes

- transversal standing on low beam
- darts
- shooting at the horizontal aim with a ball

INTERPRETATION OF THE RESULTS WITH THE DISCUSSION

All results were collected, statistically processed and the following statistical values were calculated:

- average value
- standard deviation
- statistical series scope
- T - test
- P - the level of statistical significance

Survey of the results for fifth-grade pupils with damaged hearing and hearing children (boys) is stated in Table 1 (the tables are given as an appendix).

From the table it can be seen that statistically significant differences appeared in the following variables: 30 m run (for evaluating sprint speed), standing on one foot and transversal standing on low beam (for evaluating balance) and darts (for evaluating accuracy), as well as in variable of body weight for evaluating morphological status. As it was supposed, in all physical abilities which are not directly controlled by the mechanism for synergic regulation and regulation of tonus (apart from 30 m run) there are not any considerable differences between children with damaged hearing and children with normal hearing. However, in physical abilities which are mostly under the control of the mechanism for structure of movement, i. e. submechanism for synergic regulation and regulation of tonus statistically significant differences between the results achieved by children with damaged hearing compared with the results of children with normal hearing. Hearing children achieved significantly better results in these tests (Tab. 1).

Different from the boys, where the differences appeared in tests for evaluating abilities under the influence of tonus regulation mechanism, girls (fifth-grade pupils) had significant differences in the following tests: long jump, 30 m run, standing on one foot with closed eyes and transversal standing on low beam (Tab. 2).

In this case the differences appeared in the abilities under the control of two mechanisms: for synergic regulation and the regulation of tonus and mechanism for the regulation of the intensity of excitation.

Between sixth-grade boys, statistically significant difference was found in only one test - agility in the air, in which hearing boys had considerably better results (Tab. 3). However, when six-grade girls are concerned, there were significant differences between those with damaged and normal hearing. These differences appeared in the following six tests: long jump, throwing the medicine-ball, 30 m run, agility in the air, hand tapping and standing on one leg with closed eyes. In all those tests hearing female pupils achieved significantly better results (Tab. 4).

As it can be noticed from the tables, in both subsamples of girls, the most prominent differences between girls with damaged and girls with normal hearing appeared in the balance tests. The reason for this can be found in the damaged hearing which could be a consequence of a damage on the level of internal ear. This means that apart from the

hearing organs the disturbance can spread to vestibular apparatus which has a primary role in balance keeping. The entire physiology of balance keeping is a complex process based on the system of reciprocal working of a number of organs, even their parts. Vestibular nucleuses in brain stem are connected with cerebellum, oculomotors, spinal cord and brain cortex, as well as vegetative centres. All this explains the complexity of this process. It is important to emphasize that both balance tests were performed with closed eyes, so in that situation vestibular apparatus had a leading role in balance keeping. This is probably the reason why the children with damaged hearing achieved significantly worse results than hearing children in those two balance tests.

As it can be seen from the presented results and the last example in which girls were concerned, a significant difference appeared in the tests which were used to evaluate physical abilities controlled by the mechanism for regulation of the intensity of excitation and synergic regulation and the regulation of tonus. Since this did not happen in the case of either subsample of boys, there are certain indications that in fifth and sixth-grade girls the reciprocal influence of the mechanisms for regulation of intensity of excitation and the mechanism for synergic regulation and the regulation of tonus is more prominent than in boys. This supposition deserves attention of the researches.

CONCLUSION

The research Comparative analysis of the physical development and abilities of pupils with damaged and pupils with normal sense of hearing was performed on the sample of fifth- and sixth-grade pupils of primary schools for children with damaged and normal hearing. A battery of three tests for morphological characteristics and ten tests for physical abilities was applied. From the obtained results it can be concluded that:

There are no significant differences between children with damaged and normal hearing in their morphological characteristics.

The level of physical abilities of girls with damaged hearing (which are under the control of mechanism for regulation of intensity of excitation and mechanisms for synergic regulation and regulation of tonus) is significantly lower than that of their hearing peers. Damaged hearing influenced the development of:

- balance as a consequence of damaged vestibular apparatus and connections with higher nervous structures;
- speed of running and the explosive force of legs, probably due to the weaker movement coordination.

When fifth-grade boys with damaged hearing are concerned, the level of physical abilities is significantly lower when compared with their hearing peers in the abilities mostly under the regulation of mechanisms for synergy and regulation of tonus.

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APPENDIX

Tab.1

No	variables	healthy children		children with damaged hearing		t	p
		M	s	M	s		
1.	height	158.08	7.83	153.44	6.82	1.436	0.1665
2.	weight	48.54	9.02	40.33	8.37.	2.158	0.0432*
3.	bouncing a ball ag. t. wall	8.69	3.12	8	3.94	0.48	0.6504
4.	long jump	150	23.36	122.22	20.63	2.871	0.0094*
5.	throwing a medicine-ball	347.69	43.23	275.56	75.85	2.844	0.01*
6.	30 m run	46	3	57.33	4.70	-5.1	0.0001*
7.	flexions in mixed hang	7.08	3.68	5.44	2.24	1.181	0.2514
8.	agility in the air	153.92	11.34	192.44	35.49	-3.686	0.0015*
9.	hand tapping	37.15	3.02	31.11	5.88	3.17	0.0048*
10.	standing on one foot with closed eyes	37.85	22.27	7.89	4.62	3.948	0.0008*
11.	transversal standing on low beam	7.85	1.82	5.89	3.14	1.854	0.0786
12.	darts	18.38	9.09	19.79	10.62	-0.33	0.7446
13.	shooting at the horizontal aim with a ball	13.15	5.79	9.67	3.87	1.575	0.131

Tab. 2.

No	variables	healthy children		children with damaged hearing		t	p
		M	s	M	s		
1.	height	147.3	7.73	144.9	6.25	1.22.	0.2313
2.	weight	4.47	6.61	3.35	4.90	2.563	0.0153*
3.	bouncing a ball ag. t. wall	8	2.60	7.18	2.21	0.995	0.3275
4.	long jump	156.76	13.91	146.18	22.12	1.671	0.1045
5.	throwing a medicine-ball	335.29	40.64	321.76	54.48	0.821	0.4179
6.	30 m run	48.71	3.22	2.12	4.54	-2.528	0.0166*
7.	flexions in mixed hang	9.23	3.17	10.35	3.04	-1.049	0.3022
8.	agility in the air	144.82	13.47	149.76	25.58	-705	0.4861
9.	hand tapping	29.06	2.90	30.47	5.14	-0.986	0.3313
10.	standing on one foot with closed eyes	32.76	10.26	11.94	8.47	6.456	0.0001*
11.	transversal standing on low beam	13.23	6.41	6.41	2.81	3.134	0.0003*
12.	darts	29.41	10.90	19.23	7.77	3.134	0.0037*
13.	shooting at the horizontal aim with a ball	13.18	55.21	12.06	5.59	0.603	0.551

Tab. 3.

No	variables	healthy children		children with damaged hearing		t	p
		M	s	M	s		
1.	height	149.08	7.67	148.45	7.34	0.202	0.8419
2.	weight	39.38	5.66	39.18	6.96	0.079	0.938
3.	bouncing a ball ag. t. wall	4.85	2.37	5.36	2.06	-0.564	0.5783
4.	long jump	157.31	10.13	133.64	21.92	3.489	0.0021*
5.	throwing a medicine-ball	278.69	44.38	281.36	46.32	0.341	0.7362
6.	30 m run	49.85	3.10	57.73	5.48	-4.425	0.0002*
7.	flexions in mixed hang	5.54	2.26	6.73	2.98	-1.114	0.27755
8.	agility in the air	157.69	16.79	170.45	32.18	-1.247	0.2256
9.	hand tapping	31.61	2.18	31.54	3.36	0.061	0.95516
10.	standing on one foot with closed eyes	41.46	21.79	8.82	8.89	4.64	0.0001*
11.	transversal standing on low beam	10.38	3.23	4.91	2.12	4.808	0.0001*
12.	darts	19.69	12.26	13.45	6.36	1.519	0.1429
13.	shooting at the horizontal aim with a ball	10.08	4.75	12.18	6.51	-0.914	0.3704

Tab. 4

No	variables	healthy children		children with damaged hearing		t	p
		M	s	M	s		
1.	height	152.23	7.63	154.3	5.68	-0.717	0.4812
2.	weight	44.31	9.47	39.3	2.63	1.617	0.1209
3.	bouncing a ball ag. t. wall	9.85	2.19	9.50	2.63	1.617	0.1209
4.	long jump	155.77	19.02	165.5	9.26	-1.482	0.15531
5.	throwing a medicine-ball	366.92	40.29	340	24.49	1.86	0.077
6.	30 m run	47.92	3.07	50.6	4.86	-1.617	0.1208
7.	flexions in mixed hang	11.46	5.17	12.2	1.62	-0.433	0.6692
8.	agility in the air	128.69	12.15	146.3	9.32	-3.797	0.0011*
9.	hand tapping	34.85	3.67	33.3	3.20	1.057	0.3024
10.	standing on one foot with closed eyes	33	22.50	18.1	10.98	1.918	0.0688
11.	transversal standing on low beam	12.61	6.32	11.5	6.33	0.419	0.6792
12.	darts	26.15	17.35	18.4	12.02	1.205	0.2415
13.	shooting at the horizontal aim with a ball	14.61	4.03	13.1	5.55	0.76	0.4557

KOMPARATIVNE ANALIZE FIZIČKOG RAZVOJA I MOGUĆNOSTI UČENIKA SA OŠTEĆENIM I NORMALNIM ČULOM SLUHA

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Na uzorku od 48 učenika oštećenog sluha i 56 zdravih učenika primenjena je opšta baterija JZFK i specifična baterija testova za procenu fizičkih sposobnosti. Na osnovu dobijenih rezultata može se zaključiti da su učenici oštećenog sluha postigli značajno slabije rezultate u testovima za procenu: ravnoteže, brzine trčanja i eksplozivne snage u odnosu na zdrave učenike. U ostalim testovima dobijene razlike ne dostižu nivo statističke značajnosti.

Ključne reči: *učenici, fizičke sposobnosti, vestibularni aparat, oštećenja, sluh, fizičko obrazovanje, morfološke dimenzije*