COMPARISON OF PSYCHOMOTOR ORGANIZATION ON PHYSICAL ABILITIES OF DEAF AND HEARING CHILDREN

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Abstract
With this paper we wanted to determine the impact of psychomotor organization of the physical abilities of children of school age. The sample consisted of 103 subjects of both sexes age between 12 and 14 godina. Sample was divided into experimental and control group. The experimental group consisted of 47 deaf subjects with hearing impairment over 90dB without physical deformities, while the control group consisted of 56 patients who regularly heard without physical deformities.For the purposes of this research were used standardized tests Serbian Institute of Physical Culture, which are used to track the physical development and physical abilities of children and adolescents age aged 11 to 15 years. The results show that there are significant statistical differences between deaf patients and healthy subjects, particularly between female subjects, and that deaf children are the worst results achieved by the tasks that are conditioned by the ability to reflect balance and movement coordination. The results confirm that in the education of deaf children necessary respect for individual specifics of their development and respect for the principle of proportionality psychomotor organization and physical exercise.

Key words*: deaf children, psychomotor organization, education, physical exercise, physical abilities.*

Introduction

Basic physical movement is natural phylogenetic corporal movement characteristic for human kid. A human individual spontaneously gains control over it very early in life. It shows that almost entire process of basic physical movement is finished before a child starts school, that is, before being introduced to physical education curricular programs. In deaf children education, respecting rules of their development, it is necessary to follow the principle of psychomotor organization and physical exercise proportion. That practically means that quality of psychomotor organization should determine the physical exercise level (Slavnić, Kovačević, 2005).

Psychomotor organization is valued through activities of psychomotor bracing consisting of: psychical structures (motivation and intelligence), then CNS structures (cortex, cerebellum, extra-pyramidal areas, reticular system, spinal cord front horn cells), as well as muscle structures (muscle plate, muscle spindle and muscle fibers (Ćordić, Bojanin, 1985). Common for physical exercise and psychomotor activity is movement and praxis activity. It actually represents assemble and praxis activity. It actually represents assemble of complex and interlinked voluntary movements which execute intended action. Consequently movement is basic constitutive element of every motor activity, and praxis activity is organized by cortical areas and completed by motorics (Gayton, 1985). If fact, movement arises between developing personality, CSN and neuromuscular structure on one hand and social sphere and environment on the other. It transfers emotional demands and skillfulness of voluntarily organized activities aimed at outer world, while ascending stimuli flow into muscles, nervous structures and child's psyche. This impulse circulation towards outside and stimuli towards inside encourages nervous system myelination and synaptogenesis improving action nimbleness. In that way structures and functions of developing personality are enhanced as well as the relations between personality and reality in social circumstances. Regardless complexity and time of occurrence, every movement has to have a motive, aim and way of being performed. When physical exercise is in question it is very scarcely paid attention to. Most often attention is drawn to the way movement is performed, and motivation and aim of performed action are neglected. Since physical exercise includes skills, habits and abilities development process, it is necessary for every physical exercise, that is, several times repeated exercise, to follow the principles of development and movement performance, as well as motor organization of every individual.

Sample

Sample consisted of 103 examinees of both genders from 12 to 14 years of age. The sample was divided into experimental and control group. Experimental group consisted of 47 deaf examinees with hearing disability over 90 dB and without physical deformities while control group consisted of 56 examinees with regular hearing and without physical deformities.

Method

For the needs of the research two batteries of test were used:

1. Battery for psychomotor organization assessment within which assessment of body scheme recognition performed, lateralization on one's self and others, service and gestural lateralization, movement harmonization by rhythm, fingers motorics differentiation, static and dynamic balance, as well as motor coordination of upper and lower limbs and,
2. Battery for physical development and physical abilities monitoring in children and youth from 11 to 15 years of age. Battery contained the following test: ball tapping against the wall; standing long jump; throwing medicine ball; 30 m running

Results and discussion

Analyzing obtained results of male examinees in experimental and control group (table 1) it is realized that statistically significant difference appears in the following activities: 30 m running, standing on one leg with eyes closed, standing crosswise on low bar and darts. Difference between average results in 30 m running is 3.41 tenths (t= -2.528; p= 0.166), in favor of control groups boys. The reason of low speed is the fact that often apart from organ of Corti disability also vestibular apparatus is impacted, and depending on the grade of its damage subtle or even rough disorder in coordination take place. Running represents complex motor action the success of which depends on movement frequency, and it depends on CNS ability for contraction and relaxing muscle coordination. Physical ability directly connected to hearing is balance, that is, ability to maintain stable position of the body. Differences between average results (table 1) of standing on one leg with eyes closed test are statistically significant 20.82 sec (t=6.456; p=0.0001), as well as crosswise standing on low bar test 6.85 sec (t=3.134; p= 0.0003). hearing disability can be consequence of a disorder on the level of inner ear, which means that along with receptive part also vestibular apparatus can be impacted, which has the role of keeping balance. In fact, entire balance physiology is very complex process, based on mutual cooperation system of several organs, even their individual parts. Vestibular sails in cerebral stem are linked to cerebellum, oculomotors, spinal cord and cerebral cortex, as well as vegetative centers, all explaining the complexity of reaction. It should be emphasized that both tests were performed with eyes closed, which made it even harder for the deaf children to keep the balance. It is well-known that one can successfully keep the balance using, visual mechanism even with vestibular apparatus tapping by hand; standing on one leg with eyes closed; standing crosswise on low bar; darts and throwing ball at horizontal target. In statistic data processing t-test was applied which is a part of parametric statistic procedure group, and for final processing statistic program STET WIEV 512 was used.

The following statistic parameters were varied:M – arithmetic average, S – standard deviation, T – value of t-test, p – statistic significance, Min, max – statistic series scope. This study was conducted in elementary schools for deaf students' „Radivoj Popovic" in Zemun and "Stevan Dečanski" in Belgrade and regular primary schools "Lazar Savetić" in Zemun and "Sveti Sava" in Belgrade during the 2015/16 school year.

Table 1. Average result of male examinees of 12 years of age in experimental and control group

n	Variables	Examinees with regular hearing		Deaf examinees		t	p
		M	s	M	s		
1.	Ball tapping against the wall	8	2.60	7.18	2.21	0.995	0.3274
2.	Standard long jump	156.76	13.91	146.18	22.12	1.671	0.1045
3.	Throwing medicine ball	335.29	40.64	321.76	54.48	0.821	0.4179
4.	30 m running	48.71	3.22	52.12	4.54	-2.528	0.0166
5.	Tapping by hand	29.06	2.90	30.47	5.14	-0.986	0.3313
6.	Standing on one with eyes closed	32.76	10.26	11.94	8.47	6.456	0.0001
7.	Standing crosswise on low bar	13.23	6.41	6.41	2.81	3.134	0.0003
8.	Darts	29.41	10.90	19.23	7.77	3.134	0.0037
9.	Thawing ball at horizontal target	13.18	5.21	12.06	5.59	0.603	0.551

Analyzing the results of male subjects experimental and control groups (Table 1) showed that a statistically significant difference occurs in the activities: running at 30 m, standing on one leg with eyes closed, standing on a low cross shaft and darts. The difference between the average results when running at 30 m 3.41 tenths (t = - 2.528; p = 0.0166) in favor of boys in the control group. The reason for the low speed is the fact that it is often next to the walls of kortijevog body affected and the vestibular apparatus, and depending on the extent of his damage comes to fine or even coarse disturbance in coordination. Running a complex motor action of which the success of an important movement frequency, and it depends on the ability of the CNS to the coordination of contraction and relaxation of muscles. Physical ability that is directly associated with hearing and the balance, the ability to maintain the body in a stable position. The differences between the average results (Table 1) Test on standing on one leg with your eyes closed as 20.82 sec statistically significant (t = 6.456; p = 0.0001), as well as the standout Test transversely at low shaft 6.85 sec (t = 3.134; p = 0.0003). Hearing impairment may be due to a disorder at the level of the inner ear, which means that in addition to receptor works may be affected and the vestibular apparatus, which has a role in maintaining balance.

In fact, the whole physiology of balance is quite a complex process, which is based on a system of mutual sadejstava multiple organs and even their individual parts. Vestibular nuclei in the brainstem are associated with a small brain, okulomotorima, spinal cord and cerebral cortex, as well as vegetative centers, and this explains the complexity of the reaction. It should be noted that both test done with closed eyes, the deaf child even more harder to maintain balance. It is known that if it is damaged vestibular apparatus man can, using only the visible mechanism, with great success to maintain a balance, simply by sight observes a vertical position. The optical information is the same information from semicirkularnih channels, and it can help the centers of gravity to provide that the person to lose balance if it does not immediately preempt any appropriate motion. The difference between average results in darts (Table 1) for the assessment of precision is 14.10 points in favor of healthy children (t = 3.134; p = 0.0037). Precision is the ability to accurately and space observations, the accuracy of the exercise movement. Invalid precision usually occurs in situations when you need to estimate the distance to an object. Since you how much importance optical information for deaf children can be determined by tests for the assessment of precision. However there is one problem has been observed in some children and that occasionally occurs, and that is a discrepancy between the manipulative activities and direct views in these activities, or poor visuomotor control that in the case of this study, and caused lower results.

Table 2. Average result of female examinees of 12 years of age in experimental and control group

n	Variables	Examinees with Regular hearing		Deaf examinees		t	p
		M	s	M	s		
1.	Ball tapping against the wall	4.85	2.37	5.36	2.06	-0.56	0.5783
2.	Standard long jump	157.31	10.13	133.64	21.92	3.485	0.0021
3.	Throwing medicine ball	278.69	44.38	281.36	46.32	0.34	0.7362
4.	30 m running	49.85	3.10	57.73	5.48	-4.425	0.0002
5.	Tapping by hand	31.61	2.18	31.54	3.36	0.061	0.9516
6.	Standing on one with eyes closed	41.46	21.79	8.82	8.89	4.64	0.0001
7.	Standing crosswise on low bar	10.38	3.23	4.91	2.12	4.808	0.0001
8.	Darts	19.69	12.26	13.45	6.36	1.515	0.1429
9.	Thawing ball at horizontal target	10.08	4.75	12.18	6.51	-0.914	0.3704

In table 2 differences are shown between physical development and physical abilities of 12 year old girls. Statistically significant differences appeared at the following variables: long jump, 30 m running, crosswise standing and standing on one leg. Average result in long jump by girls in control group is 157.31 cm and is better than average result achieved by girls in experimental group (133.64 cm) by 23.67 cm (t=3.489; p= 0.0021). This difference of great statistic significance shows that 12 year old girls in experimental group have low „explosive" strength (ability to invest maximum energy into one movement). Deaf children are at risk, as consequence of hearing disability, of movement coordination disorder, as seen in long jump performance. Weaker average results except little „explosive" strength were conditioned by movement discoordination in prep phase important for achieving success in jump (prep phase includes semi squat, leg stretching and arm swing). Difference between average results in 30 m running has high statistic significance in favor of healthy girls and amounts to 7.88 tenths (t=4.425; p=0.0002). Tests for balance assessment show difference of high statistic significance as well in favor of girls in control group. Test standing on one leg with eyes closed shows difference of 32.64 sec (t=4.64; p=0.0001).

Table 3. Average result of male examinees of 14 years of age in experimental and control group

n	Variables	Examinees with Regular hearing		Deaf examinees		t	p
		M	s	M	s		
1.	Ball tapping against the wall	8	2.60	7.18	2.21	0.995	0.3274
2.	Standard long jump	156.76	13.91	146.18	22.12	1.671	0.1045
3.	Throwing medicine ball	335.29	40.64	321.76	54.48	0.821	0.4179
4.	30 m running	48.71	3.22	52.12	4.54	-2.528	0.0166
5.	Tapping by hand	29.06	2.90	30.47	5.14	-0.986	0.3313
6.	Standing on one with eyes closed	32.76	10.26	11.94	8.47	6.456	0.0001
7.	Standing crosswise on low bar	13.23	6.41	6.41	2.81	3.134	0.0003
8.	Darts	29.41	10.90	19.23	7.77	3.134	0.0037
9.	Thawing ball at horizontal target	13.18	5.21	12.06	5.59	0.603	0.551

Results of examined activities of 14 year old boys between experimental and control group were not statistically significant (table 3). However, results obtained from the same activities examined on 14 year old girls almost in all examined variables indicate statistically significant differences between control and experimental group. Statistically significant differences are present /in favour of girls in control group) in long jump (t=2.871; p=0.0094); throwing medicine ball (t=2.844; p=0.1); 30 m running (t=5.1; p=0.0001); tapping by hand (t=3.17; p=0.0048); standing on one leg with eyes closed (t=3.948; p=0.0008). Bad coordination indirectly or directly takes part in weakening the remaining abilities of deaf children as can be noticed if two test are compared – one for running speed assessment (at 30 m) and the other for arm movement speed assessment (tapping by hand).

Table 4. Average result of female examinees of 14 years of age in experimental and control group

n	Variables	Examinees with Regular hearing		Deaf examinees		t	p
		M	s	M	s		
1.	Ball tapping against the wall	8	2.60	7.18	2.21	0.995	0.3274
2.	Standard long jump	156.76	13.91	146.18	22.12	1.671	0.1045
3.	Throwing medicine ball	335.29	40.64	321.76	54.48	0.821	0.4179
4.	30 m running	48.71	3.22	52.12	4.54	-2.528	0.0166
5.	Tapping by hand	29.06	2.90	30.47	5.14	-0.986	0.3313
6.	Standing on one with eyes closed	32.76	10.26	11.94	8.47	6.456	0.0001
7.	Standing crosswise on low bar	13.23	6.41	6.41	2.81	3.134	0.0003
8.	Darts	29.41	10.90	19.23	7.77	3.134	0.0037
9.	Thawing ball at horizontal target	13.18	5.21	12.06	5.59	0.603	0.551

Poor coordination has to participate in an indirect or direct way in weakening the other abilities of deaf children can be seen when comparing the two tests - one for the evaluation of the running speed (30 m) and the other for measuring the movement of the hands (hand tapping).

Table 5. Frequency distribution of examinees in experimental and control group

n	Variables	Examinees with Regular hearing				Deaf examinees			
		M 1	s 1	min1	max1	M 2	s 2	min 2	max 2
1.	Ball tapping against the wall	7.86	3.10	2	12	7.40	2.95	2	12
2.	Standard long jump	155.09	16.88	110	190	142.77	24.18	90	180
3.	Throwing medicine ball	334.46	49.80	170	440	307.34	57.31	180	410
4.	30 m running	48.68	309	42	58	54.11	5.61	46	65
5.	Tapping by hand	32.87	4.31	22	42	31.45	4.56	21	42
6.	Standing on one with eyes closed	36.02	19.13	14	99	11.74	9.12	3	40
7.	Standing crosswise on low bar	11.18	5.31	6	27	7.04	4.32	3	23
8.	Darts	23.84	13.15	5	64	17.81	9.15	3	46
9.	Thawing ball at horizontal target	12.79	5.13	2	27	11.85	5.48	4	22

Table 5 shows distribution of frequency concerning the entire sample of healthy children and deaf children. Regardless of gender and age, when arithmetic means of variable results (M 1, M 2) are compared, better results were achieved by healthy children.

Conclusion

Obtained results show that deaf children accomplish the worst results on tasks conditioned by balance keeping ability. Reason for such poor results is found in the fact that the largest number of deaf children for the nature of disability and un-upgraded myelination of vestibular path are not capable of successful task completion. That practically means that attention focused on balance keeping of deaf children decreases efficiency in motor action performance, which has negative influence on motor behavior. Motor coordination of upper limbs gave very interesting results. Movement direction and visuomotor control (arm – eye control) as well as imposed speed of movement performance of deaf children caused insecurity. Almost all children in the sample synchronized with rhythm equally bad.

Deaf children develop without very important benchmarks that identify them significantly, and that is the sound. That inadequate reception of hearing stimuli from external environment does not allow these children to control their own tonus, and hence movement performance, as regularly developed children. Physical abilities development, that is, psychophysical traits can be influenced by exercising in physical education process. Physical education for deaf children representes a part of general education and fundamentally it should include efforts to accomplish not only influence on physical ability of children, but also their psychical traits, especially in period when these children are prone, for the reason of their handicap, to engage in conflicts with their close environment. There we can speak about one comprehensive and harmonious deaf child`s personality shaping in the physical education process, which is supposed to complement and enhance their cognitive world of experience.

Physical activity can offer specific contribution to physical, intellectual, emotional and social development of children. If this form of activity proves as significant for healthy children, it is all the more significant for handicapped children. Having in mind that learning is accomplished by means of senses, it is clear that if one of the senses is missing, the efficient use of the remaining senses becomes even more important.

Therefore, systematic physical exercise is essential for handicapped children. The simultaneous participation of multiple motor and sensory experiences, but also cognitive and emotional, allowing individuals the opportunity to discover or rediscover values, motivations, purposes and goals (Perrotta,2010).

We conclude at the end that the effect of physical exercise depends on psychomotor organization which can be intervened, so as to significantly change motor behavior by movement performance and physical exercise, hence the entire behavior of deaf children.

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Sažetak

Ovim radom željeli smo utvrditi utjecaj psihomotorne organizacije fizičkih sposobnosti djece školske dobi. Uzorak se sastojao od 103 ispitanika oba spola uzrasta između 12 i 14 godina. Uzorak je podijeljen na eksperimentalnu i kontrolnu skupinu. Eksperimentalna skupina sastojala se od 47 gluhih ispitanika s oštećenjem sluha iznad 90 dB, bez fizičke deformacije, dok se kontrolna skupina sastojala od 56 pacijenata koji redovito čuju bez fizičkih deformiteta. U svrhe ovog istraživanja korišteni su standardizirani testovi Srpskog instituta za tjelesnu kulturu, koji su korišteni za praćenje tjelesnog razvoja i sposobnosti djece i adolescenata u dobi od 11 do 15 godina. Rezultati pokazuju da postoje značajne statističke razlike između gluhih pacijenata i zdravih osoba, osobito između ženskih ispitanika, te da gluha djeca imaju najgore postignute rezultate zadataka koji su uvjetovane sposobnošću promišljanja koordinacije ravnoteže i pokreta. Dobiveni rezultati potvrđuju da je u obrazovanju gluhe djece potrebno poštivanje individualne specifičnosti njihovog razvoja i poštivanje načela razmjernosti psihomotorne organizacije i fizičke vježbe.

Ključne riječi: *gluhe djece, psihomotorna organizacija, obrazovanje, fizičke vježbe, tjelesne sposobnosti.*

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