PSYCHOMOTOR EFFICACY OF CHILDREN WITH HEARING DISORDERS.

by

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Scarce data coming from literature maintain that children with hearing disorders can be characteristic for many abnormalities of psychomotor development among which is motion pattern formation delay. Environmental and social standard conditions should be considered as well. The goal of these studies was the assessment of psychomotor efficacy in children with hearing disorders coming from various school environments: deaf children from Educational Centre for Deaf Children as well as children from integration Special School.

The surveys were to answer the following questions:

a) How do sight and movement co-ordination, both hands co-ordination and hands and fingers dexterity in children with hearing disorders compare to those with normal hearing?

b) Is there any difference in psychomotor efficacy in relation to age and sex of the children?

c) Does the environment influence the development of discussed characteristics of psychomotor efficacy?

The studies were carried on 163 children aged 7-15 years. Test results (Meile's balls test, Roloff's forks test, tower building test) led to the following conclusions:

1. Children with impaired hearing are characteristic for worse psychomotor efficacy in co-ordination and precision of hand movement compared to healthy children.

2.Psychomotor efficacy undergoes development with age and sex is not a differentiating factor.

3. Comparison of observed characteristics did not confirm the influence of the environment.

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Introduction

In accordance with Bulenda (1993) and Pruszewicz (1992), the number of deaf children constitutes 10-15% of disabled population which is about 5000-7000 and the number of poorly hearing children amounts to 90.000-120.000.

Borkowska claims that the frequency of hearing disorders increases with age three times more often in boys than girls (Borkowska-Gaertig 1976). Due to such a big and constantly increasing number of hearing disabled persons, there is a large need of teaching optimisation. Starting such a project ,however, real level of development should be defined to enable its course control as well as to reveal its possible disturbances (Bogdanowicz 1960). Children with impaired hearing, some deviations from psychomotor development standards were found and they influenced sight synthesis and analysis process disturbances, proper movement performance ability (Góralna 1984, Kunicka-Kaiser, Smoleńska 1973), hyperactivity and concentration disturbances (Kelly 1993, Matwijko 1984). EEG computer analysis revealed patterns pointing at brain right regions prevalence being responsible for sight-space information processing in children with hearing disorders (Wolf et. al. 1989). The above data are only fragmentary and do not take into account environmental and social factors which largely influence the child's development (Maszczak 1975, Matwijko 1984, Bielczyk 1995). The goal of the paper is psychomotor efficacy evaluation in children with hearing disorders depending on age, sex and two different school environments: Educational Centre for Deaf Children were only deaf children learn and Special School for Deaf Children were poorly and normally hearing children were integrated.

Material and Methods

The studies were carried on 163 children aged 7-15 years divided into three groups:

I pupils from Educational Centre for Deaf children (72 children)
II pupils from Special School for Deaf Children (47 children)
III primary school pupils

Children from groups II and III learned in the same school building and attended some classes together.

Hearing impairment of 50 - 100 dB was found in special schools children.

The material was divided into four groups in accordance with age:

A - 1st and 2nd grade pupils (group I-15; II-9; III 9).

B - 3rd and 4th grade pupils (group I-20; II-14; III-12).

C - 5th and 6th grade pupils (group I-19; II-7; III-9).

D - 7th and 8th grade pupils (group I-18; II-17; III-14).

On the day of the test, all the children were in good physical and mental condition and they eagerly performed all the activities. No child revealed any deviation as far as cognitive function is concerned.

Sight and movement co-ordination examination evaluating psychomotor efficacy was carried on with the use of three tests.

'Meile's balls test' was based on inserting 30 balls into the funnel with the use of small forceps. Performance time as well as error number (dropped balls) were registered. The examination was performed with predominant hand.

'Roloff's forks test' was based on a rapid placement of 20 metal circles on forks. Circles were to be put individually and the hands could not be leaned against the table during the performance. The test was performed twice with each hand.

In the 'tower building test', children constructed a tower as tall as possible from small elements. Tower size was estimated by the number of used elements. Realisation time was not concidered. The test was performed twice with each hand.

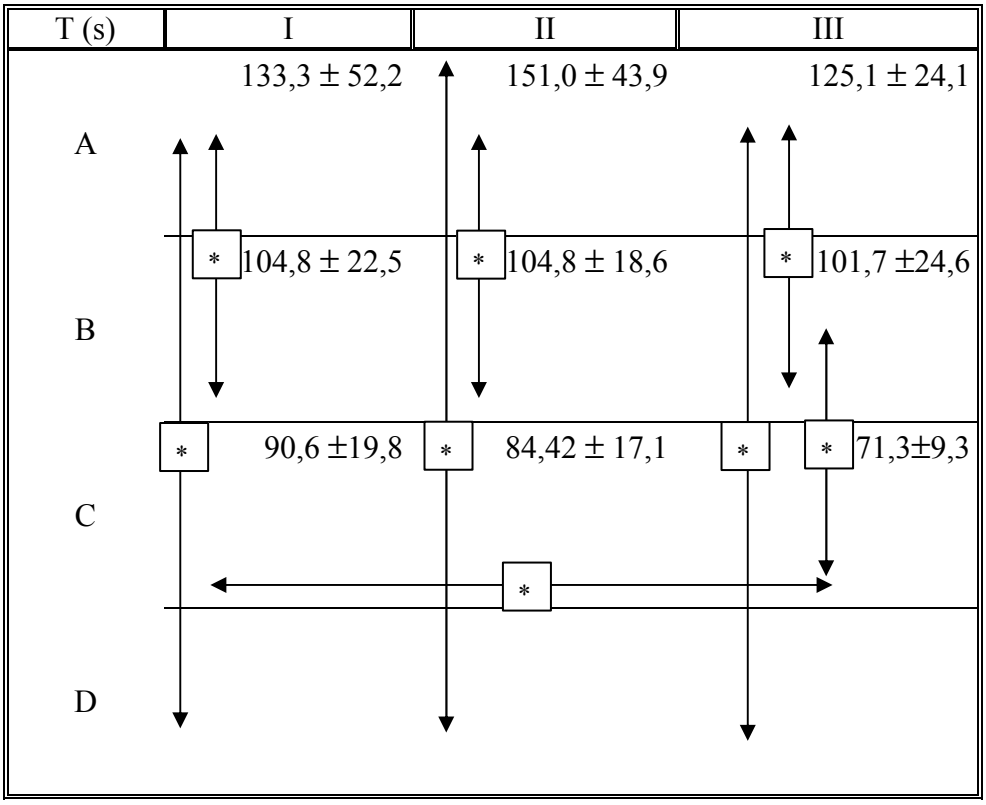
Due to groups numerical force, variance analysis as well as Scheffe's multiple comparison test were used for statistical purposes.

Results

Hand movement precision and control.

Results of Meile's balls test revealed the shortening of exercise time along with children's age. The oldest children performed the test in the shortest time, and in this group, primary school pupils reached the best results (75,1+\-44,o) (Tab.1).

Table 1. Comparison of Mean Values of Meile's Balls Test Performance Time in Examined Groups (Age Subgroups)



I – Educational Centre for Deaf Children Pupils
II – Integration Special School Pupils
III – Control Group

A, B, C, D – Age Subgroups
* - Statistically Significant Differences

The changes in dynamics also seem interesting. The most significant difference between the two extreme examined groups (the oldest and the youngest ones) was found in the results of integration school.

General number of errors did not influence significantly the time of the test performance which is especially visible in comparison of tables 1 and 2. Only in the case of children from The Educational Centre (group 10, the results were determined by the number of dropped balls (error).

Table 2. Number of Errors Comparsion in Meile's Balls Test in Age Subgroups

Error	I	II	III
A	4,7 ± 5,6	4,8 ± 1,9	5,6 ± 3,6
B	4,0 ± 2,8	4,4 ± 2,7	5,1 ± 3,7
C	4,2 ± 4,1	3,4 ± 2,6	2,0 ± 3,4
D	4,5 ± 4,6	3,5 ± 2,9	3,5 ± 2,7

Biomanual co-ordination.

Roloff's forks test performance time decreased with age and this observation referred to both right and left hand exercises (Tab.3,4). However , the notion 'right hand' refers to the dominant hand and 'left hand' to the non-dominant one. This exercise was performed fastest by the children working with the right hand. It did not refer to the results of the pupils of IIIrd and IVth grades from integration school (109,6+\-14,8s. - left hand, 112,0+\-21,3s. - right hand) as well as to the youngest and the oldest ones from group III (A-119,6+\-20,3s. -left hand, 128,7+\-21,8s. -right hand; D-77,4+\-8,2s. - left hand, 86,4+\-8,9s. - right hand) (Tab. 3,4).

Table 3. Comparison of Times Mean Values in Roloff's Force Trial in Examined Groups with Age Subgroups Consideration (Right Hand)

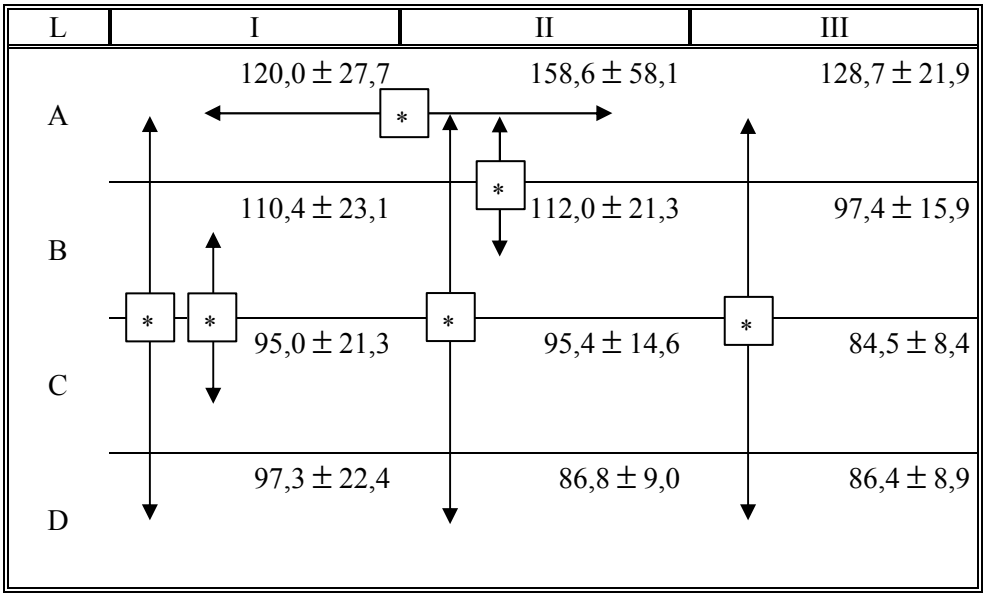
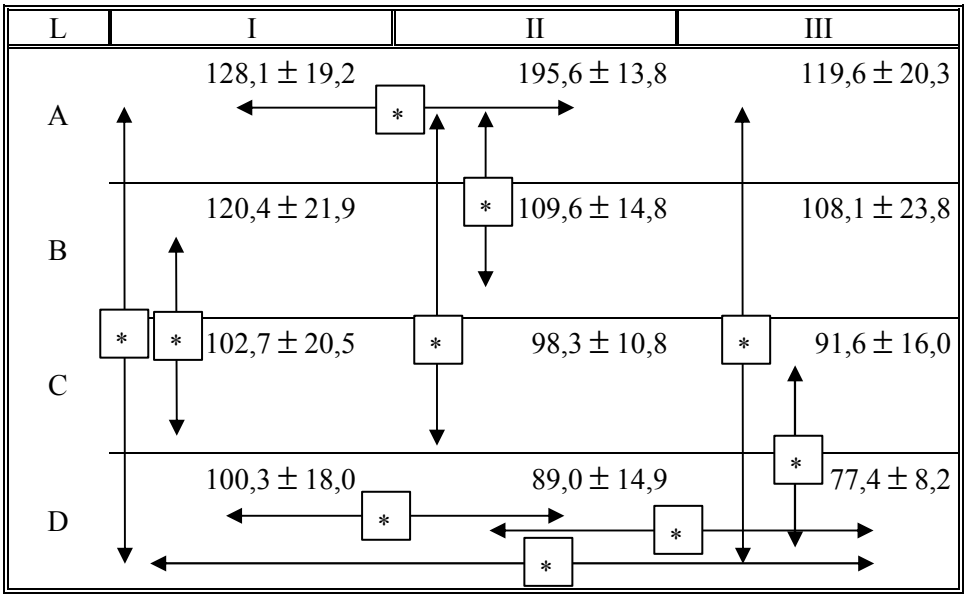


Table 4. Comparison of Times Mean Values in Roloff's Force Trial in Examined Groups with Age Subgroups Consideration (Right Hand)



Single hand co-ordination.

The analysis of results did not reveal tower size dependence on constructors age. In the group of Educational Centre pupils, the tallest towers were built by the subgroup B children. In the group of integration school, D group children were the best on working with the right hand whereas with the left hand C group children had the best results.

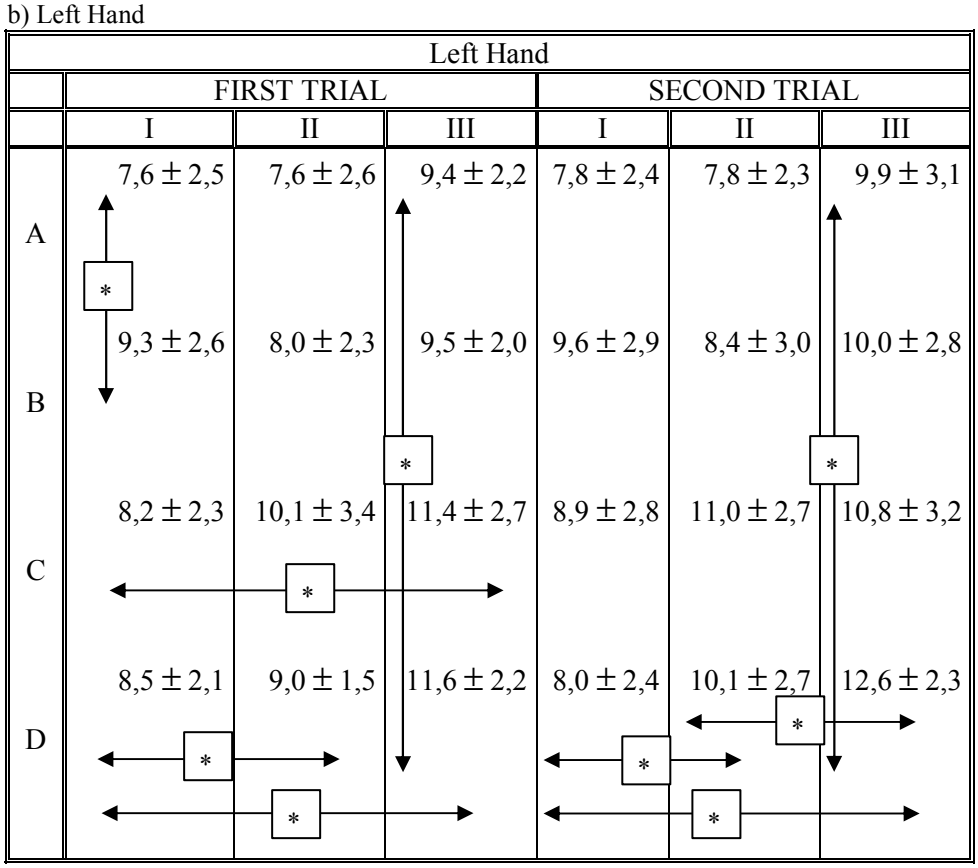
It is important to notice that in all examined groups, towers built in the second trial were taller and their size differences are more visible in the left hand trial (Tab. 5a,b).

Table 5. Comparsion of Tower Elements Number in Examined Age Subgroups

a) Right Hand

Right Hand						
	FIRST TRIAL			SECOND TRIAL		
	I	II	III	I	II	III
A	7,8 ± 3,0	8,3 ± 1,6	8,2 ± 2,1	8,5 ± 3,8	8,9 ± 2,7	9,4 ± 3,2
B	9,6 ± 3,2	9,6 ± 2,9	9,3 ± 3,0	9,8 ± 3,2	10,4 ± 3,0	11,0 ± 2,0
C	8,8 ± 2,3	8,9 ± 2,7	9,4 ± 1,4	9,7 ± 2,9	8,7 ± 3,0	10,5 ± 2,8
D	7,5 ± 1,8	10,0 ± 3,0	10,3 ± 3,0	8,4 ± 2,0	11,8 ± 3,2	11,8 ± 3,2

b) Left Hand



Discussion

The literature contains various data concerning psychomotor efficacy of children with impaired hearing. Earlier studies revealed that such children show worse sight and movement co-ordination in comparision to healthy individuals of the same age (Borodulin-Nadzieja et.al. 1999). The observed results in the range of synkinesis, dynamics and precision of movements (evaluating motor performance (Zazzo 1974)) proved to be similar to the results of Myklebust's surveys (Myklebust 1966). Apart from tower building test, children from special schools gained worse results but statistically significant differences were found only in a few cases.

It is difficult to answer the question whether and to what degree the environment forms psychomotor development of a child within the examined

range. Only in the Roloff's forks test in subgroups A and in the tower building test for subgroup D (left hand performance), statistical differences were found between two hearing impaired children groups developing in different conditions. Matwiejko proved that hyperactive children occur more often among children impaired hearing than in healthy children.

The applied tests required precision and concentration. It seems that worse effects gained by children from special schools might result from poor concentration on the task.

Conclusions

1. Children with impaired hearing reach worse psychomotor efficacy in the range of hand movement co-ordination and precision.
2. Psychomotor efficacy examined at particular age undergoes development and sex is not a differentiating factor.
3. Compared environments were not univocally found to influence the development of the examined features.

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