ASSESSMENT OF PHYSICAL EFFICIENCY IN CHILDREN WITH HEARING DISORDERS

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Annotation. Assessment of general physical efficiency in children with hearing organ impairment was researched with respect to the impairment degree. The research included 32 children suffering from hearing organ impairments of various degrees, in the Hearing Disorders Child Centre in Wroclaw. The European Physical Efficiency Test "Eurofit" was used in the research. The results showed that hearing impairment does not statistically significantly differentiates predispositions for balance disorder tolerance. Additionally, it was stated that the impairment degree had only slight influence on children"s physical efficiency, and what is most important, physical efficiency of children with hearing disorders was similar to average efficiency among hearing children.
Keywords: physical efficiency, children's, hearing impairment, physical development.

Introduction

The assessment of physical efficiency is one of the basic elements of health education. Tests are not merely the symbol of advancements but also a measure for improvement in pedagogical process efficiency Caspersen C. J.(1985), Sallis J.F. et al.,(1992).Testing shows the constituents of aptitude and physical efficiency and their importance in self-assessment and health creation. It serves to encourage conscious control of individual efficiency level, stimulates improvement (Lopatto S.,(1960), Mydlarski J., (1934), Trzesniowski R., (1989).

The aim of this research was to assess extensive general physical efficiency in children with hearing disorder of mild, moderate and severe degrees. Additionally, the influence of the disorder degree on physical efficiency development were subjected to statistical analysis.

Material and method.

The research included 32 children with hearing disorders in Hearing Disorders Child Centre in Wroclaw and was carried out in February 2006. As a result, 7 children were diagnosed with mild hearing disorder (between 20-40 dB), 10 children with moderate disorder (between 40-70 dB) and remaining 15 children – severe hearing disorder (above 90 dB). Research material was divided into two groups depending on the degree of hearing disorder: group I – mild and moderate (17 children), group II – severe (15 children).

The research covered 32 children, 15 girls and 17 boys, aged between 11 and 17, with average age of 14.5. However, a small number of research material excluded simultaneous division into age and sex groups. All children staying at the above mentioned centre were included in the physical education programme of 45-minute sessions conducted twice a week, recommended by the Institute of Pedagogics of Ministry of Education. Additionally, all children on the programme were allowed to use the swimming pool twice a week. Classes of physical education were conducted by teachers with sudopedagogical qualifications and fluent use of sign language.

Research method

European Test of Physical Efficiency "Eurofit" was used for extensive general physical efficiency assessment. The test included the following attempts:

1. Flamingo balanced test - balanced position on one lower limb,
2. plate tapping,
3. sit and reach test,
4. standing broad jump,
5. handgrip test,
6. sit-ups in 30 seconds,
7. bent arm hang,
8. 10x5m shuttle run.

Tests were conducted in the gym in the order mentioned above. Each attempt was first demonstrated and explained. Children performed the attempts barefoot, wearing sports outfits. Teacher of physical education explained each attempt to children throughout the entire test. Children were motivated and encouraged to be precise and fast and to persevere with verbal gestures. They were keen to participate and willing to compete. The statistical analysis was used in the research (2).

Research results and discussion

Test results of specific "Eurofit" attempts in children with hearing organ disorder were as follows: AD.1) Scoring system used in the first attempt was confusing. Points awarded defined the number of falls, but score related to attempts not carried out (number of falls>15). Test chi-square used, showed statistically significant correlation between attempt result and hearing organ disorder degree ($p<0.05$). However this correlation was surprising as children suffering from moderate hearing disorders achieved better results and children with mild disorders achieved the worst results – the test was carried out by 29% of participating children (tab.1).

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Table 1.

Analysis of test attempt 1 – considering the degree of hearing organ impairment

Hearing impairment degree	balanced position [pts]				
	0	1	2	3	4
MILLD	5	0	1	0	1
MODERATE	0	3	6	1	0
SEVERE	7	5	2	1	0
TOTAL	12	8	9	2	1
chi-square test	18,00				
P	0,02				

In dichotomous division (tab.2), due to the degree of hearing organ impairment, the advantage of the less impaired children was visible over those with higher impairment degrees. However, the disadvantage in this particular attempt was not big enough to be considered of statistical significance ($p>0.05$). The analysis carried out on bigger research group could allow for showing statistically significant correlation.

Table 2.

Results of first attempt in children with hearing organ impairment in comparable groups

Degree of hearing impairment	balanced test			
	numbers		percentage	
	negative	positive	negative	positive
MILD AND MODERATE	5	12	29%	71%
SEVERE	7	8	47%	53%
TOTAL	12	20		
chi-square test	1,01			
P	0,31			

Ad.2) In the second attempt – plate tapping – (Table 3), similarly to the previous one, the highest average was observed in the group of children with moderate hearing disorder, whereas the worst results were noted in the mild degree of impairment group. ANOVA variance analysis method used showed no significant difference in averages ($p>0.05$), but difficulties interpreting the results and the fact of significantly lower standard deviation in the group of children with mild disorder, which caused the formal variance analysis result requirements not to be met, suggest the dichotomous division to be the cause.

Table 3.

Results of second attempt, the number of disc tapping repetitions described in points

Hearing impairment degree	plate tapping [pts]			
	x	sd	min	max
MILLD	118,6	17,7	100	150
MODERATE	132,5	56,5	80	280
SEVERE	120,5	54,5	70	300
TOTAL	123,8	48,6	70	300
ANOVA test	0,22			
P	0,80			

In dichotomous material division, no statistically significant difference was observed in disc tapping attempt results distribution. A significant individual disparity was noted among the attempt results, irrespective of hearing disorder degree (Table 4).

Table 4.

Results of second attempt in children with hearing disorders in comparable groups

Hearing impairment degree	plate tapping [pts]			
	x	sd	min	max
MILD AND MODERATE	126,8	44,3	80	280
SEVERE	120,5	54,5	70	300
TOTAL	123,8	48,6	70	300
t-student test	0,36			
P	0,72			

Ad.3) In the third attempt – sit and reach test – variance analysis showed no statistically significant difference in average performances between groups of children with various degrees of hearing organ impairments (Table 5).

Table 5.

Results of third attempt in children with hearing disorders in comparable groups

Hearing impairment degree		bending forward		
	x	sd	min	max
MILLD	9,3	9,3	-7	19
MODERATE	11,1	9,6	-9	27
SEVERE	8,7	11,4	-10	28
TOTAL	9,6	10,2	-10	28
ANOVA test	0,16			
P	0,85			

With dichotomous division (Table 6) of the material, no statistically significant correlation between attempt performance distributions and degree of hearing disorder was observed, either. Children with milder hearing impairment achieved better results but their advantage over severely impaired children could not be considered statistically significant. The reason lies in big values of standard deviations in both group, seriously exceeding differences of averages.

Table 6.

Analysis of results of third attempt with dichotomous division of the material

Hearing impairment degree		bending forward		
	x	sd	min	max
MILD AND MODERATE	10,4	9,3	-9	27
SEVERE	8,7	11,4	-10	28
TOTAL	9,6	10,2	-10	28
t-student test	0,44			
P	0,66			

Ad.4) Results of the fourth attempt showed that children with mild hearing impairment probably proved least physically efficient accidentally. In this attempt their average result differed from those of other groups. But it was not related to the hearing impairment degree. Variance analysis (including comparison of three average values) did not show significant differences in average values anyway (Table 7).

Table 7.

Results of the fourth attempt in children with hearing organ impairment in comparable groups

Hearing impairment degree	standing broad jump			
	x	sd	min	max
MILLD	100,1	20,5	63	120
MODERATE	142,2	30,4	93	190
SEVERE	134,5	58,5	58	210
TOTAL	129,4	46,4	58	210
ANOVA test	1,98			
P	0,16			

Dichotomous division analysis proved the above, although the best average result was achieved in the group of children with severe degree of hearing disorder (Table 8).

Table 8.

Analysis of results of fourth attempt with dichotomous division of the material

Hearing impairment degree		standing broad jump		
	x	sd	min	max
MILD AND MODERATE	124,9	33,7	63	190
SEVERE	134,5	58,5	58	210
TOTAL	129,4	46,4	58	210
t-student test	0,58			
P	0,57			

Ad.5) Results of fifth attempt showed that the best average result was achieved by children with severe hearing disorder. The weakest result was achieved in the group of children with mild disorders, which proves the above conclusion that these are children of particularly low physical efficiency. With dichotomous division of the research material, poor results of this group lowered the average in the combined group (mild and moderate hearing impairment) which showed even further difference in relation to the severely impaired group. This difference was of statistical significance, which was presented in (Table 9).

Table 9

Results of fifth attempt in children with hearing organ impairment in comparable groups

Hearing impairment degree		handgrip test		
	x	sd	min	max
MILD AND MODERATE	19,5	5,9	11	35
SEVERE	26,1	10,7	10	40
TOTAL	22,6	9,0	10	40
t-student test	2,20			
P	0,04			

Ad.6) All children carried out sixth attempt – sit-ups in 30 seconds. Keen competition could be clearly observed among participants. Children who did not participate in the test encouraged those tested to increase the exercise speed. In this attempt the biggest number of repetitions was achieved by children with mild hearing impairment (up to 21) and the lowest score was achieved by children with moderate impairment. Average result level in this attempt was similar to all three groups with varied degrees of hearing disorders. Therefore, variance analysis failed to show statistically significant difference. For the some reasons no significant difference was observed in averages with the dichotomous material division. Only higher disparity in individual results within the groups of severe hearing impairment is worth noting (Table 10).

Table 10.

Results of sixth attempt in children with hearing organ impairment in comparable groups

Hearing impairment degree	sit-ups in 30 seconds			
	x	sd	min	max
MILD AND MODERATE	19,9	3,8	15	25
SEVERE	20,7	6,1	5	30
TOTAL	20,3	4,9	5	31
t-student test	0,45			
P	0,66			

Ad.7) One child did not carry out the seventh attempt. This child was excluded in the process of calculating averages, standard deviations and variability range (min, max). The best average result was achieved by children with moderate hearing disorder. The weakest one, by those with mild disorder. Observed average differences fell close to the level of statistical significance (p slightly >0.05). If statistical significance level was to be established at 0.10 (which can be justified by a small number of research material) the difference could be considered statistically significant. Combining the group of children suffering from mild impairment with those with moderate impairment remarkably lowered the average achieved. This resulted in the fact that the difference in averages between the combined group and the one with severe impairment degree could not be considered statistically significant (although the average results achieved by children with severe hearing disorders were worse). The disparity between individual results, except the group of mild disorder (where scoring related to the results of 2-3 secs) is once again worth noting here. The results of this attempt were presented in (Table 11).

Table 11.

Results of seventh attempt in children with hearing organ impairment in comparable groups

Hearing impairment degree	bent arm hang [pts]			
	x	sd	min	max
MILD AND MODERATE	360,7	180,1	145	760
SEVERE	306,1	122,0	120	500
TOTAL	336,0	156,6	120	760
t-student test	0,97			
P	0,34			

Ad.8) Scoring in attempt eight – 10x5m shuttle run – was proportional to the time achieved, the more points, the poorer the result. Hence, on average, the best result in this attempt was achieved by children with severe hearing impairment, and the worst by those with the mild one. The difference in averages fell close to statistical significance level. Similar conclusions can therefore be drawn to those formed above (related to hanging down attempt) with the difference being that the „leaders" were the children suffering from severe hearing impairment (Table 12).

Table 12.

Results of eighth attempt in children with hearing organ impairment in comparable groups

Hearing impairment degree	10x5m shuttle run [pts]			
	x	sd	min	max
MILD AND MODERATE	226,4	37,7	170	300
SEVERE	206,8	45,9	120	290
TOTAL	217,2	42,2	120	300
t-student test	1,32			
P	0,20			■

Discussion

The assessment of physical efficiency is one of the basic elements of health education. Tests are not merely the symbol of advancements but also a measure for improvement in pedagogical process efficiency Caspersen C. J.(1985),

Sallis J.F. et al.,(1992). Testing shows the constituents of aptitude and physical efficiency and their importance in self-assessment and health creation. It serves to encourage conscious control of individual efficiency level, stimulates improvement (Lopatto S.,(1960), Mydlarski J., (1934), Trzesniowski R., (1989). Dziedzic and Ritzke (1979) presented their opinions on the topic of development and physical efficiency in deaf children, especially boys, and stated that in relation to the norms described by Trześniowski (1989) it can be considered as normal. The later claims that extensive physical efficiency of deaf children was lower than that of healthy children. On the other hand, the physical efficiency of deaf girls was higher than that of deaf boys. A contradicting opinion was presented by Maszczak (1985). Who claimed that deaf boys‟ height and body mass were lower but their physical efficiency was similar to that of hearing boys. In his opinion, deaf children‟s breathing capacity, described by chest circumference, did not differ much from that of hearing peers. The most extensive research into development and physical efficiency of all population of deaf children in Poland was carried out by Maszczak (1985). The programme included assessment of physical development level based on height, body mass and chest circumference measurements as well as assessment of physical efficiency tests measured by Denisiuk‟s test. Maszczak carried out comparative analysis of his results, the results of Trześniowski‟s tests (2004), related to particular morphological indexes among hearing children and teenagers, and the data by Łopatto (1960) – related to deaf children. Maszczak‟s results (1985) showed that both deaf boys and girls tested in 1972 exceeded their deaf peers from 1938 research in terms of height and body mass. Additionally, in comparison with hearing children tested in 1962, both height and body mass of tested deaf children showed lower arithmetic average values. Physical development of deaf girls progressed more dynamically than that of their hearing peers. Achieved research results showed that development acceleration phenomenon observed among teenagers occurred among deaf children as well, but at a slower speed compared with hearing children.

Based on his research, Maszczak (1985) did not confirm the widespread view that thoracic cavity development in deaf children was lower than among hearing children. The analysis of physical efficiency level showed that the best developed feature of deaf boys‟ motorics was flexibility, and the weakest being strength. The best developed features of deaf girls‟ motorics were endurance and flexibility, whereas strength was the weakest one. The level of deaf girls‟physical efficiency was slightly higher in comparison with deaf boys. Most importantly, Maszczak‟s research (1985) showed that physical efficiency of deaf children located at the level of average efficiency among hearing children. The achieved results suggest that deafness does not determine in a significant way physical or motor efficiency development, although the speed of growing among deaf children was slower compared with hearing children, and average height and body mass were lower. The results of research by Dziedzic and all (1979) may be compared to Maszczak‟s (1985) claim saying that the best developed motoric feature among deaf children was flexibility and the weakest – strength. To sum up, it can be stated that physical efficiency among children with hearing disorders only to a small extent differs from hearing children‟s efficiency.

Conclusions

The results of particular “Eurofit” attempts are comparable in both groups tested. Tests showed that children of more severe level of hearing impairment performed even better in some test attempts than those with milder disorders. As a result it can be said that physical efficiency of these children was similar to that of healthy peers in terms of some healthy children performing better physically than other healthy children.

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