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Energetic and Coordination Abilities of Deaf Children

by

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The presented paper has been focused on motor abilities of deaf children, with differentiation of energetic and coordination areas of fitness. The European Fitness Test "Eurofit" for children aged 6-18 (Eurofit 1989) was used to assess the level of motor abilities. Besides the "Eurofit" test, four other tests were performed to evaluate specific coordination abilities [Raczek 1995]. The results indicate that deafness may influence the outcome of motor tests, with significant differentiation of energetic and coordination abilities.

It was assumed that energetic abilities of deaf children, unlike coordination ones, remain at an average level of healthy subjects.

Keywords: *motor abilities, coordination, deaf children*

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Introduction

Hearing is a sense necessary for proper mental and physical development. Research done by Myklebust proves that the lack or deficiency of hearing caused by internal ear changes or central nervous system (CNS) can disturb motor development [Myklebust 1964]. Defects of hearing can cause more or less pronounced symptoms of delayed psychomotor development, motor oversensitivity, motor disturbances of involuntary movement [Góralówna 1993, Perier 1992]. Balance disturbances are observed, because of internal ear defects (vestibular organ), [Perier 1992, Shephard 1990]. In addition, balance problems of deaf children have been observed as the so called "accompanying" disability. [Frisina 1973, Maszczak 1977, Pannella 1979, Gayle 1990, Korzon 1995]. Deaf children have significant problems in performing simple motor tasks, as maintaining balance on chosen leg, walking linear forward foot by foot, jumping and clapping one's hands over head, reacting quickly [Brunt & Broadhead 1982, Zody 1990]. Despite that, it is a well known fact that vestibular deficiency can be compensated by other senses [Blair 1986, Perier 1992, Latkowski 1997].

The presented paper has been focused on the evaluation of motor abilities of deaf children and youth with differentiation of energetic and coordination areas of fitness, under assumption that deaf children's energetic abilities, unlike coordination ones remain at a good level.

Material and methods

Selected tests were performed by 190 deaf children and youth, intellectually normal, aged 10-15, from (Centers for Education of Deaf Children and Youth) from the Upper Silesia Region.

The children were classified as follows: hearing level decreased by 40-60 dB 6,8% of tested children, decreased by 60-80 dB – 27,4%, and decreased by over 80 dB (deep deafness) – 65,8% (Fig. 1).

Table 1. Age and number of deaf girls and boys.

	Age												Total
Group	10		11		12		13		14		15		
	F	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	
D	16	21	13	14	30	19	10	16	8	20	11	12	190

D – number of deaf children, F –female, M - male

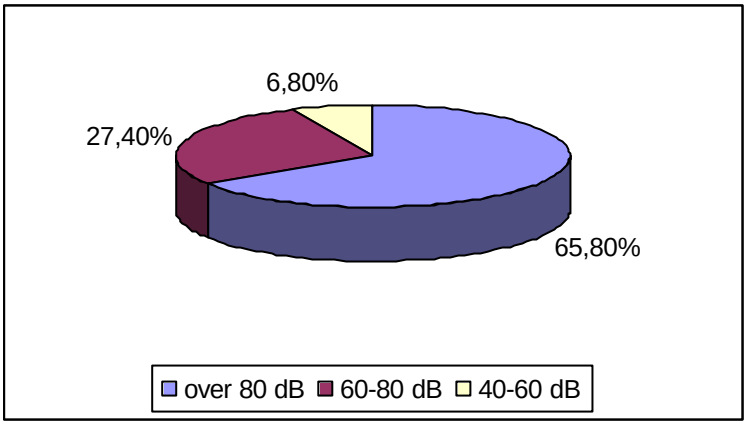

Fig. 1. Deafness level [dB]

Motor development was evaluated by selected tests of the European Physical Fitness Test "Eurofit" for children and youth aged 6-18 ("Eurofit" 1989). Besides the "Eurofit" test, four additional tests were performed to evaluate specific coordination abilities [Raczek 1995]. From the 12 tests applied, half were energetic tests (1-6), and the other half (7-12) – coordination ones.

1. Plate tapping (speed of limb movement PLT) – [Eurofit 1989].
2. Trunk bending forwards in sitting position (flexibility SAR) – [Eurofit 1989].
3. Standing broad jump (explosive strength SBJ) – [Eurofit1989].
4. Hand grip (static strength HGR) – [Eurofit 1989].
5. Sit-ups (trunk strength SUP) – [Eurofit 1989].
6. Bent arm hang (functional strength BAH) – [Eurofit 1989].
7. Flamingo balance (general balance FLB) – [Eurofit 1989].
8. Shuttle run 10 x 5 m (running speed – agility SHR) – [Eurofit 1989]
9. Target jumping (kinesthetic differentiation)[1].
10. March to the goal (space orientation)[1].
11. Standing broad jump forwards and backwards (movement adjustment and movement combining)[1].
12. Catching of the Ditrich stick (speed of reaction)[1].

The selection of tests allowed to separate two areas of motor fitness and allowed to analyze possible differences between coordination and energetic abili-

[1] [Raczek et al. 1995]

ties of deaf children. All tests were performed according to its manuals [CONI 1988, Grabowski 1989].

The methodology, adopted in standardization process of the Eurofit test for Dutch children was used to establish the level of motor development [Klodecka-Rózalska 1993]. In effect, five motor levels were established, based on the results obtained in particular age and gender groups of deaf children. Such a procedure enabled an individual assessment of each child. Then the percentages of examined population of deaf children were calculated, corresponding to low (L), under average (UA), average (A), over average (OA) and high (H) level of motor fitness.

The results of energetic and coordination tests were compared.

Results

Poor performances of deaf children were observed in the energetic tests. It was established that the curve of energetic tests shows discriminating attributes. The highest percentage of deaf children remain at a low level of motor fitness (L) and the smallest percentage – at a high level of motor fitness (H) (Fig. 2 and 3, tab. 4, 5).

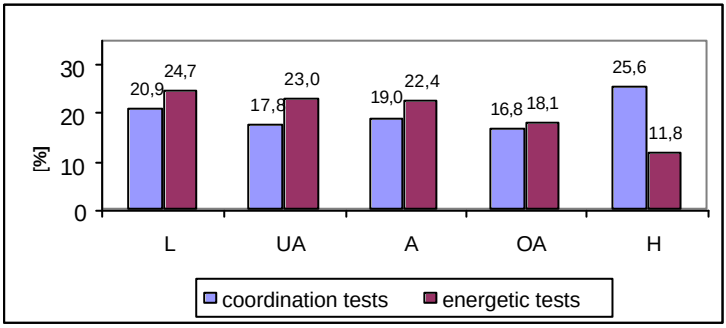

Fig. 2 Percentages of numbers of deaf boys in energetic and coordination tests at motor level: L – low, UA – under average, A – average, OA – over average, H – high.

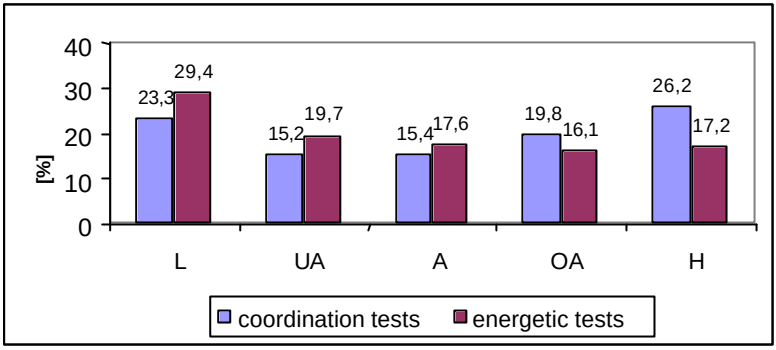

Fig. 3. Percentages of deaf girls in energetic and coordination tests at motor level: L – low, UA – under average, A – average, OA – over average, H – high.

Table 2. Coordination tests

	Boys							Girls					
1	**L**	**UA**	**A**	**OA**	**H**	**S**		**L**	**UA**	**A**	**OA**	**H**	**S**
	64	17	9	3	9	102		50	8	11	8	11	88
%	62,7	16,6	8,8	2,9	8,8	100,0		56,8	9,09	12,5	9,0	12,5	100,0
2													
	12	12	20	26	32	102		12	13	13	24	26	88
%	11,7	11,7	19,6	25,4	31,3	100,0		13,6	14,77	14,7	27,27	29,55	100,0
3													
	10	20	27	17	20	94		17	21	19	15	14	86
%	10,6	21,2	28,7	18,0	21,28	100,0		19,7	24,4	22,1	17,5	16,3	100,00
4													
	13	27	30	10	14	94		16	24	13	16	17	86
%	13,8	28,7	31,9	10,6	14,9	100,0		18,6	27,9	15,1	18,6	19,8	100,0
5													
	10	13	12	19	39	93		11	3	8	20	43	85
%	10,7	13,9	12,9	20,4	41,9	100,0		12,9	3,5	9,4	23,5	50,6	100,0
6													
	12	14	12	22	34	94		15	10	16	20	25	86
%	12,7	14,8	12,7	23,4	36,2	100,0		17,4	11,6	18,6	23,3	29,0	100,0

Table 3 S Coordination test

Boys								Girls					
	L	UA	A	OA	H	S		L	UA	A	OA	H	S
	121	103	110	97	148	579		121	79	80	103	136	519
%	20,9	17,8	19,0	16,7	25,6	100,0		23,3	15,2	15,4	19,8	26,2	100,0

1 *Flamingo balance,* ***2*** *Plate tapping,* ***3*** *Catching of the Ditrich stick,* ***4*** *Standing broad jump forwards and backwards,* ***5*** *Target jumping,* ***6*** *March to the goal*

Tab.2,3 . Percentages of deaf girls and boys in coordination tests at motor level: L – low, UA – under average, A – average, OA – over average, H – high.

In case of coordination tests, the highest percentage of deaf children was observed at extreme levels (L and H) and lower percentages at average levels (UA, A, OA) (Fig. 2 and 3, tab. 2, 3). A reversement of the Gauss curve is evident. Such a result could be caused by many factors, for example: type of hearing defect, phenomenon of compensation, lack or deficiency of hearing is compensated by other senses.

Table 4. Energetic tests

Boys								Girls					
1	**L**	**UA**	**A**	**OA**	**H**	**S**		**L**	**UA**	**A**	**OA**	**H**	**S**
	24	22	18	24	14	102		16	17	21	19	15	88
%	23,5	21,6	17,6	23,5	13,7	100,0		18,2	19,3	23,9	21,6	17,0	100,0
2													
	16	21	31	20	14	102		13	17	21	19	18	88
%	15,7	20,6	30,4	19,6	13,7	100,0		14,8	19,3	23,8	21,6	20,5	100,0
3													
	13	33	20	23	13	102		19	11	18	20	20	88
%	12,8	32,4	19,6	22,6	12,7	100,0		21,59	12,5	20,4	22,7	22,7	100,00
4													
	16	27	30	19	10	102		14	26	17	12	19	88
%	15,7	26,5	29,4	18,6	9,8	100,0		15,9	29,5	19,3	13,6	21,6	100,0
5													
	63	20	9	4	6	102		62	10	4	3	9	88
%	61,8	19,6	8,8	3,9	5,9	100,0		70,5	11,4	4,5	3,4	10,2	100,0
6													
	19	18	29	21	15	102		31	23	12	12	10	88
%	18,6	17,7	28,4	20,6	14,7	100,0		35,2	26,1	13,6	13,6	11,3	100,0

Table 4. S energetic tests

Boys							Girls					
	L	UA	A	OA	H	**S**	L	UA	A	OA	H	**S**
	151	**141**	**137**	**111**	**72**	**612**	**155**	**104**	**93**	**85**	**91**	**528**
%	**24,7**	**23**	**22,39**	**18,1**	**11,76**	**100,00**	**29,36**	**19,70**	**17,61**	**16,10**	**17,23**	**100,00**

1.*Trunk bending forwards in sitting position (flexibility SAR),* ***2****. Standing broad jump (explosive strength SBJ), 3.Hand grip (static strength HGR),* ***4****.Sit-ups (trunk strength SUP),* ***5****. Bent arm hang (functional strength BAH),* ***6****. Shuttle run 10 x 5 m (running speed – agility SHR).*

Tab.4,5 . Percentages of deaf girls and boys in energetic tests at motor level: L – low, UA – under average, A – average, OA – over average, H – high.

The comparative graphs of coordination and energetic abilities show the same tendency for both genders. The distribution of population does not show a normal (Gaussian) distribution.

Discussion

The differences in the level of energetic and coordination abilities, with the predominance of the second ones in deaf children may be explained by the lack of hearing ability and appropriate compensations that follow.

In evaluating motor fitness of deaf children it must be stated that energetic abilities, mainly strength and endurance remain at a low level. Most likely this phenomenon is caused by a sedentary life style of deaf children. Deaf children may also lack motivation for physical activities, what according to Mainel can be explained by the fact that verbal abilities and accompanying thinking regulate physical movements. Speech is a significant movement stimulus since it replaces direct stimulation which affects the child only through particular senses. It is a process were conditional relations are created between a word and sensations. This leads to permanent relations between sensory and verbal stimuli. Speech thus permanently affects physical activeness of children.

Coordination abilities of deaf children were not at such a low level as the energetic ones (table 1). In analyzing the results of coordination tests, especially kinesthetic differentiation, space orientation and speed of movements, the highest percentage of children, both male and female were at a high level. In tests evaluating motor adjustment and speed of reaction, deaf children obtained average results and their distribution was normal. Potter and Silverman (1995) indicate that in situations were vision controls movement; deaf children perform better than healthy subjects. Brunt and Broadhead believe that the better

eye-hand coordination of deaf children is an outcome of teaching and training were visual stimuli are emphasized. Deaf children were discriminated only in tests evaluating the sense of balance. The majority of boys and girls reached poor results in the balancing task. This phenomenon is an effect of neurophysiologic consequences of deafness, what is confirmed by research in this area (Myklebust 1964, Gayle and Polman 1996, Sheperd 1990, Lindsey et al, Perier 1992, Brunt et al 1982). The lower level of balance in deaf children is attributed to vestibular defects, most often related to cerebral meningitis.

The presented results relate only to a population of deaf children, thus they can not be compared to other research projects in this area where control groups of healthy subjects existed. It may be concluded that the impairment of some coordination abilities in deaf children may negatively influence muscular strength and endurance, what in general leads to a lower level of physical fitness.

Conclusions

Results of motor tests, performed by deaf children indicate extremely low or high level of physical fitness. A low percentage of the examined population achieves average results, creating the distribution not normal. The results of tests allow for the conclusion that there are some specific factors modifying the results of fitness tests in deaf children.

There are significant differentiations observed in energetic motor abilities of deaf children. In energetic tests the greatest percentage of deaf girls and boys achieve a low level of motor fitness, while the least percentage – a high one. The hypothesis about nearly average level of energetic abilities of deaf children has not been confirmed.

Extreme percentages prevail in coordination tests. The lowest percentage is concentrated at an average level. The results of tests allow to conclude that deafness significantly influences the level of coordination abilities. Deafness and its consequences can cause disturbances in motor coordination. Results above average in some tests can be explained by excellent compensation of deafness by other senses.

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