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DEAFNESS AND MOTOR ABILITIES LEVEL

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Abstract. The audition injury hinders some motor motions and the organised coordination at the higher level and may be a cause of disturbances and disorder in some motor abilities adoption. It was assumed that deafness including its aetiology and injury mechanism may significantly influence the motor development of human being. The study aimed in checking if the deafness, as a result of various unfavourable factors, determines the motor development of children and youngsters. Consequently the dependency between qualitative features i.e.: signed motor level and aetiology, audition injury mechanism and the deafness degree was examined. The mechanism and aetiology of hearing correlated with the motor abilities displayed statistically significant dependencies in few motor trials only. Revealed correlations regarded mostly the coordination trials excluding the flexibility one. Statistically significant dependencies between the audition diminution and the motor abilities level were not found.

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Key words: Deafness - Motor abilities - Relationships

Introduction

Motor development vs. deaf children ontogenesis: The motor development is a children's motions development. It is an external display of complex mechanisms and processes connected with numerous functions of organism changing during ontogenesis. "Motion is a universal manifestation of human's life, the basic form of his activity and most widely used agent in contacts with the surrounding environment. It is also the main factor of human development and improvement, basic mean of education and upbringing while the motor abilities are one of the crucial conditionings of this process" [15]. Researches conducted so far point out that the lack of hearing may effect the motor development in two levels at least:

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1. The hearing loss nature relates to the central nervous system and semicircle canals integrity. The effect of hearing on the central nervous system will refer in many cases to common motor abilities: balance, locomotion, speed motions. Myklebust [11] states that results of deaf people in trials such as sitting, walking, forced movements are alike in fully hearing subjects. However, deaf people function at the lower level of the side domination, simultaneous motions, general and dynamic balance, and movements speed.

2. The deafness itself is the second layer through which the motor abilities are effected. Person who does not receive sounds, signs or other signals from surroundings may perform motor tasks in different manner. Hearing disturbances cause the disability of proper motions performance – they are too impetuous and too loud (slamming or hitting objects, stamping) [1,2,10,14,16]. Moreover, it was noted that children who are only deaf (no other disability) shuffle their feet. Myklebust [11] stated that this phenomenon is elicited by the need of gaining more detailed information about the ground as for keeping balance. On the other hand, it is believed that it may be a consequence of the lack of control through hearing and it can be reduced by proper exercises and other senses compensation.

Henceforth, the hearing injury disturbs some reflexive movements and organised coordination of higher level as well as may be an impulse for distempers or backwards in motor abilities learning.

Among many factors influencing the motor development of human organism the deafness (including its aetiology) and its degree as well the hearing injury mechanism may have a crucial meaning. These researches were to determine if the deafness, elicited by various unfavourable factors, effects the motor development of children and youngsters. Consequently, following correlations were examined:

- hearing injury degree vs. motor abilities level
- audition damage aetiology vs. motor abilities level
- hearing diminution value vs. motor abilities level.

Materials and Methods

The study encompassed 190 students with complete deafness or hearing impaired, aged 10-15 years old, coming from Silesian agglomeration and educating in a Didactic- Educational Centres for Inaudible Children and Youth. These are the only special care centres in Silesian which educate disabled in hearing young boys and girls qualified to the special schooling (Tables 1, 2).

Examined children revealed lowered levels of hearing: 40-60 decibels in 6.8%; 60-80 decibels in 37.4% and 65.8% presented children with deep audible injury – above 80 decibels (Fig. 1).

Table 1
Number of examined inaudible children

	Centre	Number	Total
Deaf and partly deaf children and youth	Didactic-Educational Centre in Racibórz	105	190
	Didactic-Educational Centre in Katowice	85	

Table 2
Age and number of examined deaf girls and boys

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

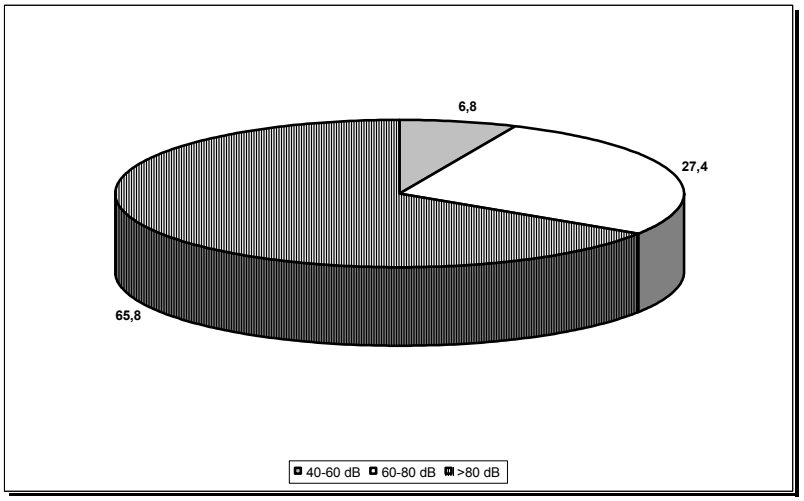

Fig.1
Hearing injury degree in DB (decibels)

Aetiology and hearing damage mechanism were determined basing on the medical interviews and examination charts. There was stated that the dominant mechanism of hearing injury is the vestibular type whereas the deafness aetiology was mostly acquired (Table 3).

Table 3
Etiology of deafness

Hearing injury aetiology					
	Deafness kind				Sum
Sex	H	C	A	I	
M	11	19	40	32	102
W	12	27	27	22	88
Sum	23	46	67	54	190
%	12.11	24.21	35.26	28.42	100

Hearing damage mechanism					
	Deafness type				Sum
Sex	CN	V	M	S	
M	21	48	17	16	102
W	8	48	21	11	88
Sum	29	96	38	27	190
%	15.26	50.53	20.00	14.21	100

Deafness aetiology: H-inherited, C-congenital, A-acquired, I- idiopathic;
Hearing injury mechanism: CN-conductive, V-vestibular, M-Mixed (conductive - vestibular), S-sensoneurotic

The European Fitness Test "Eurofit" was used in the children and youth (6-18 years) examination [6]. Four trials evaluating some specific coordinative abilities were performed additionally: jump from box to line, destination march, forward and backward long jump, Ditrich's stick grasp [15]. Half of the 12 motor tests evaluated fitness abilities while the other half coordinative ones.

Correlations considered two qualitative traits (unnumbered): motor of level vs. aetiology and hearing injury mechanism vs. deafness degree. The motor level was determined for each deaf child (H–high, OA–over average, A-average, UA-under average and L–low) as regards results of proper age and sex group. The methodology of analysis was based on experiences obtained during Dutch children

testing (Eurofit test) with determination of motor levels Kłodecka-Różalska [8]. Such motor abilities evaluation enabled taking into account the fact that research time happen in ontogenesis i.e. adolescence connected with dynamic changes in progress enhancing individual differences and boys and girls antagonisms. The division regarding hearing injury mechanism and aetiology was also made (Table 3).

Results

Test χ^2 showed statistically significant dependencies only in some motor trials confronted with hearing diminution mechanism and aetiology. Correlation analysis confirms the thesis of deafness influence on motor development, especially on the coordination capacity. The dependence between audition damage mechanism and trials of balance and fitness was stated. The statistically important dependencies occurred also between deafness aetiology and following tests: Ditrich's sticks (reaction speed), running speed (nimbleness) (Table 4).

Table 4
Correlations of motor trials vs. hearing damage mechanism and aetiology

	Motor trial	Hearing injury aetiology X^2 value	Hearing damage mechanism χ^2 value
1	Balance	16.670	22.80
2	Arm motion speed	10.390	8.858
3	Flexibility	12.460	22.360
4	Lower limbs power	9.380	8.758
5	Hand force	11.030	9.826
6	Stomach muscle strength	16.810	17.900
7	Arms force	11.170	7.0580
8	Running speed	22.390	12.680
9	Ditrich's stick	21.510	12.110
10	Forward &backward long jump	16.326	11.331
11	Box jump on line	9.877	12.223
12	Orientation march	13.295	15.550

Statistically significant trials are enhanced in grey. Critical value χ^2 21,03

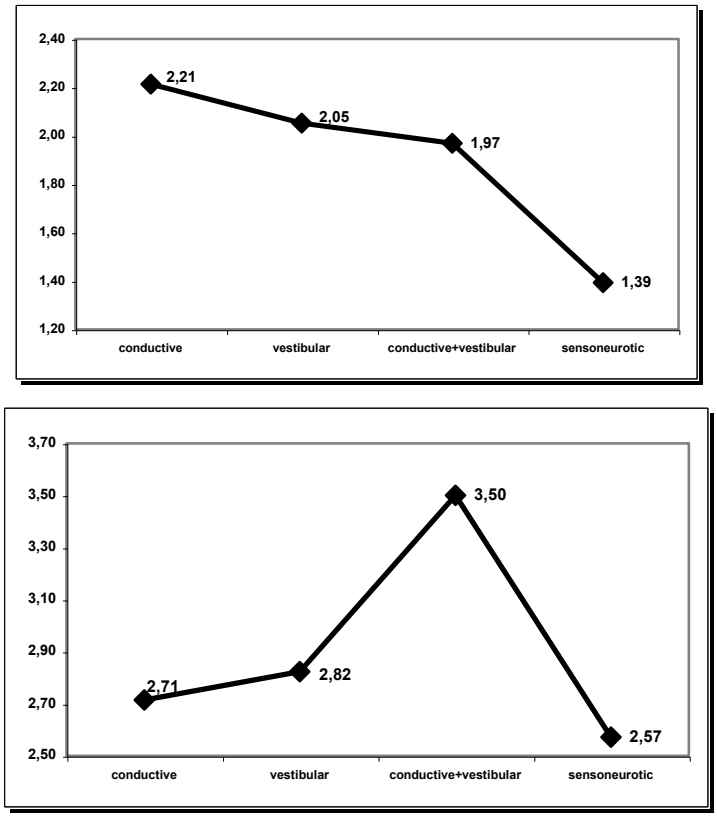

Fig. 2, 3
Average weighed values during balance and flexibility trials depending on the inaudibility damage mechanism; higher values equals better results

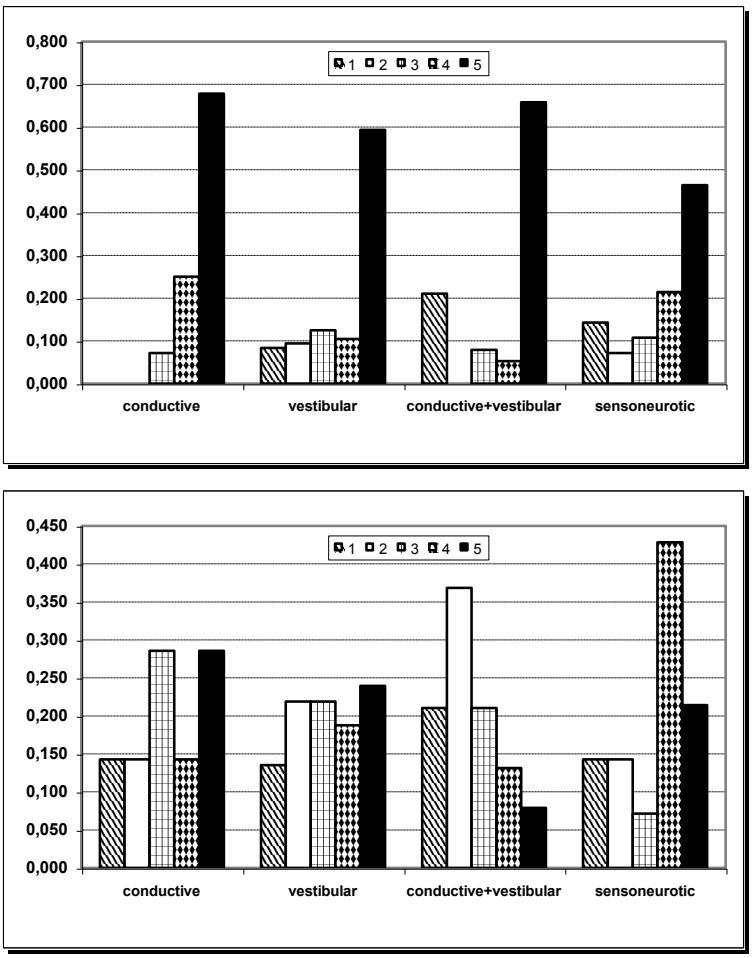

Fig. 4, 5
Frequency of deaf children occurrence on determined motor levels in flexibility and balance tests depending on the hearing injury mechanism; Motor levels: 1–high, 2–over average, 3-average, 4-under average and 5–low

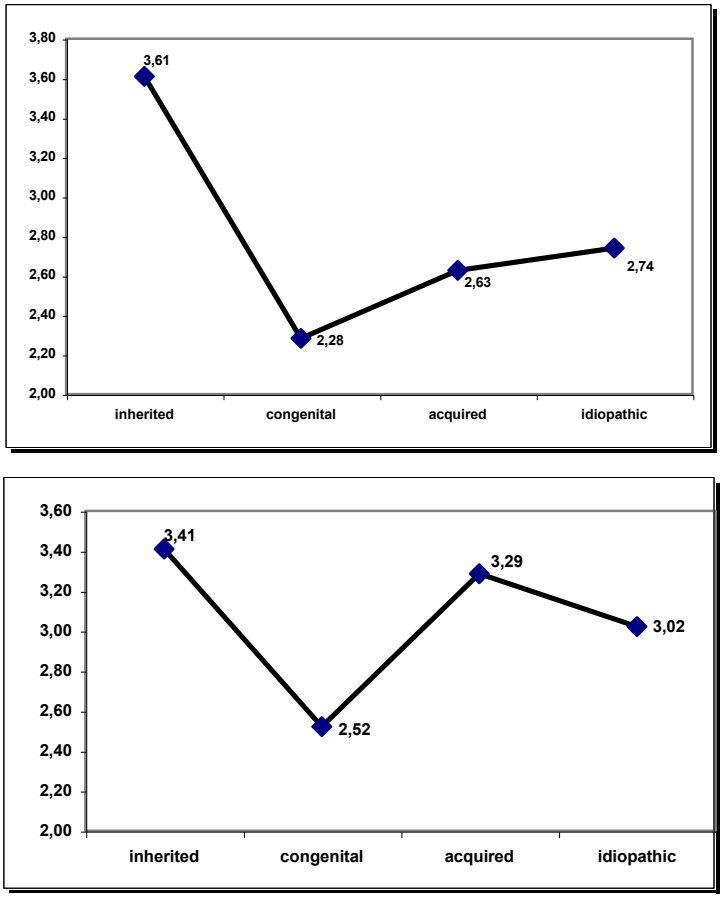

Fig. 6, 7
Average weighed values during running speed and Ditrich's tests depending on the deafness origin; higher value means better results

The hearing injury mechanism is connected with balance and flexibility trials. In the balance trial the lowest results were obtained by children with central deafness, the best–by children with transmitting inaudibility (Fig. 2). Independently, deaf children obtained results at low and below average level. High level of results occurred very rarely (Fig. 5).

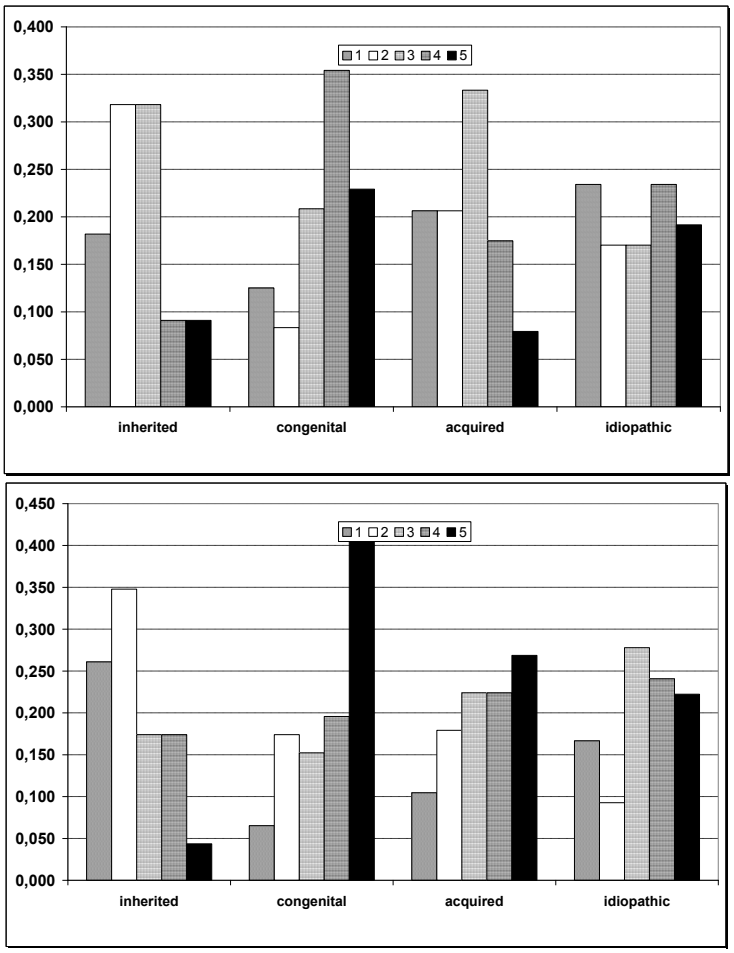

Fig. 8, 9
Frequency of deaf children occurrence on determined motor of levels in Ditrich's stick and running speed (agility) trials depending on the hearing loss aetiology. Motor levels: 1–high, 2–over average, 3-average, 4-under average and 5–low

Somewhat different are the results of flexibility trials where the dominance of best results obtained by children with mixed hearing damage was observed (Fig. 3). The fact that the level of results obtained by deaf youth is close to results reached by children with other three inaudibility kinds (conductive, vestibular, sensoneurotic) is also characteristic. Children with such hearing injuries attained weaker results the most frequently (Fig. 4).

Other motor tests did not display statistically significant dependencies with the audibility damage mechanism.

The aetiology vs. motor abilities level was another analysed correlation. In this case, the χ^2 test result points out the statistically crucial dependency as regards the running speed (nimbleness) and Ditrich's stick (reaction speed) trials.

The strongest relationship of congenital aetiology and low and below average results in deaf children was noticed in the running speed test in contrary to group of children with inherited deafness. In the latter group these results were very good. Girls and boys with such an impairment obtained results above average and high. The calculated weighed average shows the significant difference between the group with congenital inaudibility and groups with other deafness (Fig. 6). The interesting is the fact that low results are rare in youth with inherited deafness in comparison to children with congenital aetiology (Fig. 9). Regular causes of congenital deafness are mother's illnesses: roseola, toxoplasmosis, ototoxic poisoning and in case of acquired one: meningitis, otitis.

Slightly different was the dependence of aetiology and Ditrich's stick trial (reaction speed). Children with congenital deafness presented low results and the weighed average value equalled 2.52. Other subgroups results were crucially better (Fig. 7). The best outcomes achieved children with inherited inaudibility however the distance between the inherited deafness group and others (acquired and idiopathic) was minor. Consequently it may be assumed that eyesight compensates the hearing lost. There is a number of children obtaining high results in trial discussed above in comparison to other trials (Fig. 8).

Next examined correlation was the hearing damage degree vs. motor abilities. Any statistically significant dependencies between deafness degree and the motor abilities of children and youngsters were stated in all motorial tests.

Discussion

1. Mechanism and the aetiology of hearing correlated with the motor of abilities level revealed statistically significant dependencies in few motor trials only.

Research results pointing at the correlation of audible damage mechanism and the balance confirm earlier results in this field presented by Myklebust [11], Lindsey and O'Neial [14], Brunt *et al*. [3] and Butterfild [4,5,17]. The above authors regarded the worse balance as an effect of vestibular nerve injury, especially if connected with the meningitis or central neurological damages and disturbances of the central nervous system operation.

In case of the correlation between aetiology and motor capacity, results gained by children with the inherited deafness are close to those obtained by youth with acquired and of idiopathic aetiology i.e. better in relation to the congenial inaudibility. Compensation of one dysfunction by the other modality conditioned by the existence of any other unfavourable neurological factors would confirm such a conjuncture. These results are close to Boyd's [14] who noticed the fact that other deafness forms, especially early, influence the motor sphere disturbing the visual-motor organisation of motion. It occurs in the innate inaudibility not considering the internal ear. The next agent which may negatively effect tests results may be the complete focus of examinee on the examinant. The reaction may be slowed down in some trials if the concentration on the examiner is to large [16]. Brunt and Brodhead [3] stated that not hearing children are better in visual-motor coordination tasks than their healthy peers. This predominance was attributed to the visual oestrums development. If this thesis was accurate than other motor abilities could be improved by performance of more visually stimulated exercises. Such an opinion is in the coherence with presented researches outcomes.

2. The flexibility trial shows the dependence on the injury mechanism and obtained results present the higher than average level in children with the transmitting-receiving damages of hearing.

Pender and Patterson [12] already spoken in 1982 about some insignificant trend to correlation of flexibility and deafness, and obtained results seem to confirm it. Simultaneously, it allows to search further why the conductive-vestibular deafness predispose obtaining better results in comparison to other hearing damages.

3. Any statistically crucial dependencies between inaudibility and motor abilities were found. It affirms results fetched in studies conducted so far.

Conclusion

Basing on the experiment outcomes it cannot be stated that the lack of hearing determines motor development. Numerous limitations flowing from the inaudibility, its aetiology or mechanism influence this sphere of human advancement. The ability of organism to the hyper-adaptation and compensation of hearing injury with other modalities are demonstrated by deaf children who develop their motor skills in a different way and may supplement some shortages. It appears that the growth determination may consider very small group of inaudible youth where the hearing dysfunction is linked with the neurological pathology of organism. Such cases ought to be examined rather individually than statistically.

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