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INTELLECTUALLY HANDICAPPED CHILDREN VS. THEIR MOTOR ABILITIES

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Summary

Aim. More severe mental handicaps such as mild, severe and profound mental handicap, although perceived early in children's development, cause in most cases psychomotor development disorders and difficulties in adjusting to society. Purpose of this work is to present morphological and physical development of a group of 12-18 year old children with mild and severe intellectual handicap. Presented dimorphic differences in motor development level will help to understand an intellectually handicapped child and should allow adjusting the requirements to its motor abilities.

Material and methods. Material for the research was formed of 201 intellectually handicapped children, aged 12-18 years-old originating from Polish part of Carpathian Euroregion. The survey explored morphological characteristics and motor abilities with Eurofit Special Test.

Results. Motor skills level depends on sex and level of mental handicap. Boys in average have better motor skills, which are confirmed by better and higher results in physical fitness. Sex does not differentiate flexibility and similar results were found regardless of intellectual handicap level. The biggest difference in moderately handicapped boys' motor possibilities was observed in upper limbs strength, abdominal muscles strength endurance. As for girls, biggest differences were found in explosive strength of lower limbs.

Conclusions. It was demonstrated that children with mild and severe handicap aren't deprived of motor abilities. These abilities should be extended to improve handicapped people self-acceptance and better life in society.

Key words: mental handicap, dimorphism, morphological features, motor abilities

INTRODUCTION

Man comes to this world with a determined potential to develop. Its implementation depends not only on biological factors in the means of body build and functioning, but is also determined by environmental and psychological elements. These factors and their mutual interactions define the uniqueness of each human being. However they can also cause pathological course of prenatal and afterbirth development process resulting in mental handicap (1).

IQ factor is a basic determinant of mental disability, however it cannot be an absolute base to state severity of handicap. Test results are influenced by personal factors and motivations (2).

Severe mental handicap is believed to be caused by a factor inducing organic changes in brain, whereas less severe mental handicap is multifactorial, with no visible brain changes (3).

The mildest handicap shows up at the latest. Such situation influences mental handicap prevalence index, which due to life requirements, is the highest in ages 9-14 and constitutes 2-3% of Polish children, with 1-2% quota in general population. That is why the part of chil-

dren with mild handicap experiences no major difficulties to function in population in adulthood (4). This kind of mental handicap makes it a little difficult for kindergarten children to perform everyday tasks. The first and the most visible symptom of this intellectual malfunction manifests usually in difficulties with implementing scholastic duty. This type of handicap appears among 80% of all disabled population (5).

More severe mental handicaps, such as moderate, severe and profound are observed in early period of child's development. These handicaps cause in most cases very early psychomotor disorders. It is estimated that 13% of all mentally handicapped people have serious limitations and need help (6).

People with such problems do not understand speech or any instructions, they need constant care as they are usually unable to learn self-service activities and in consequence they are incapable of self-existence (7). They require complex therapeutic activity because of difficulties in adjusting to their environment. Lack of reaction and therapy will deepen the problems and create new ones caused by improper environmental influences.

With a proper support from their families and society, stimulation by reasonable educational process and the possibility of employment, 90% of mentally handicapped people have a chance to lead a happy, healthy and productive life (8). Mentally handicapped people cannot be separated from and be neglected by the society. They constitute a group too numerous to be ignored and that is why their motor abilities need to be carefully examined in many directions. Sit, McManus, McKenzie and Lian (9) claim that although children physical activity was widely surveyed, there is still too little reference on mentally handicapped children. Based on research, authors claim that the level of physical activity in special schools is insufficient and only cooperation between educational unit, home and social organizations can help to achieve advisable level of physical activity (PA) among children in special schools. Prevalence of mental handicap in children is of 2-3% in population (10). Within this group 20-30% children represent more severe level of intellectual handicap and the rest are those with mild intellectual handicap (11).

Ministry of National Education pilot program entitled "*Early, multi-specialized, complex, coordinated and constant help for children endangered with handicap, handicapped children and their families*", which was to determine quantity and quality of needs and medical, social and educational problems concerning 0-7 year old children with handicap, includes series of statistical data. Among others, the program states that in 1996 almost 73 thousand Polish people including 15 thousand 0-14 year old children were subject to a survey on population health conducted by Central Statistical Office. It states that 3,4% of all 0-14 year old children are handicapped and that the handicap appears more often in families in bad material condition (12). Among 6 941 652 0-14 year old children, 184 206 are handicapped including 99 843 of those aged 0-9.

Based on GUS (Central Statistical Office) data from 2001, assuming that the population of children aged 0-7 is of approximately 3,4 million, 3,4% of handicapped children equals around 115 thousand of handicapped children, including 52 thousand of them from rural areas.

Handicap index for European countries is estimated to 2,2-3,2% and mental handicap concerns 60-70% of all handicapped children (2, 10).

Among individuals handicapped at moderate and severe level, children with Down's syndrome constitute the most homogenous group. The frequency of Down's syndrome is estimated at around 10% (13), assuming that 75% of people with Down's syndrome are more severely handicapped (moderate and severe handicap), 20% are profoundly handicapped, and only 5% mildly.

Down's syndrome was described in 1866. It is characterized by typical morphological features like short height, smaller skull size, slanting eyes and small nose and ears. Transverse palmar crease is observed, called monkey crease. There are many defects in internal organs, speech is mumbling and inarticulate. Movements of these people are clumsy and not precise. According

to the survey carried out in London and in its suburbs the frequency of Down's syndrome births is of 1/666. J. Zaremba (1975) reports that the risk of Down's syndrome birth in Poland is at 1/700 births, and the number of children aged 3 to 18 with moderate and severe handicap is of around 50 thousand (11).

Even in this group, positive effects concerning muscles strength growth and physical fitness during progressive load trainings are possible (14).

Increasing physical fitness of mentally handicapped child should be perceived in several aspects. Obtaining at least minimal independence from the environment in order to gain its acceptance is one of them. Siguan (15) emphasizes that the main problem of these children is not their intelligence development but shaping their personalities.

Acknowledging their motor skills will let to choose appropriate loads during therapeutic training, physical education and during activities increasing physical fitness – as a health factor, essential in proper physical development of every child (16).

AIM OF THIS WORK

The present work aims to introduce morphological and physical development of boys and girls aged 12-18, with moderate and severe intellectual handicap and to present dimorphic differences in the level of motor development. This will help to understand and to adjust requirements to individual motor skills of mentally handicapped child.

Research hypothesis: Standard of morphological features and motor skills depends on sex and level of intellectual handicap.

MATERIAL AND RESEARCH METHODS

The research was continuous and carried out in 2000-2007. At the beginning only girls aged 8 to 18 years old were examined and the results were published in monography (17). Later on, in 2006, the research was completed among boys in order to reveal dimorphic differences in morphological and motor features.

The present study shows the results analysis of morphological and motor features in equal age groups. Examined groups included boys and girls aged 12 to 18. All examined children originated from Polish site of Carpathian Euroregion. The study group counted 201 individuals including 117 boys (tab. 1).

The most numerous group were the children with moderate intellectual handicap, including 67,8% of girls and 68,3% of boys

Morphological measurements included:

- body mass (kg),
- height (cm).

Obtained results served to calculate BMI, which was then used to classify examined children considering body mass deficiency, excess or norm. Due to small quantity of participants in every age group, children were joined to form two groups of boys and girls, with the average age of 15 years.

Table 1. Characteristic of examined individuals considering their age, sex and handicap level.

Sex	Handicap	Age [years]							Total
		12	13	14	15	16	17	18	
BOYS	severe	8	6	5	7	1	4	6	37
	moderate	25	15	14	8	7	4	7	80
	Total	33	21	19	15	8	8	13	117
GIRLS	severe	7	4	3	3	0	3	7	27
	moderate	16	14	8	10	5	0	4	57
	Total	23	18	11	13	5	3	11	84

Examined children motor skills were determined using Eurofit Special Test results (18).

Measurement of individual skills in physical fitness research was carried out in the following order:

- long jump from standing position – explosive strength of lower limbs test,
- sitting from lying position – stomach muscles strength test,
- bending forward in sitting position – flexibility test,
- 25 meters run – speed test,
- pushing medicine ball – strength of upper limbs test.

Mollison index was used to mark sex dimorphism level.

It allows to set the differences of examined features with various titres and variability level (17) as well as it presents similarities or differences between sexes.

Basic statistic methods were used to analyze test results: arithmetic mean, standard deviation, one-way ANOVA – Snedecor F-test (19).

RESULTS

Basic morphological features results such as body mass, height were presented with consideration of sex and mental handicap level in table 2.

Average level of boys' and girls' morphological features and motor skills was presented. Hypothesis about differentiation of these features and abilities depending on sex, was verified with one-way ANOVA method (Snedecor F-test) with significance level of $\alpha = 0,05$. This table compiles values of dimorphism index (W_d). Motor skills measurements results depending on sex and mental handicap level were presented in table 3 and 4.

Arithmetical means and sex dimorphism index (W_d) values of examined motor skills were higher in boys group and they were statistically significant for lower and upper limbs strength, speed and abdominal muscles strength.

As for height and body mass measurements, higher values were observed in boys group, although only height values showed statistically significant.

In flexibility and dimorphism index evaluation, both boys and girls presented negative value. It suggests that sex does not differentiate flexibility results.

Investigating morphological features and motor skills dependence of examined children with moderate handicap showed that sex significantly differentiates boys body height. In this group boys also had a greater body mass and a slightly higher BMI index. Boys achieved better results in motor skills tests. The greatest, statistically significant differences appeared in upper and lower limbs strength test and abdominal muscles strength. However it should be emphasized that analysis of average values and sex dimorphism index showed the greatest differences (to girls' advantage) in flexibility test.

Arithmetical means and sex dimorphism index values for chosen morphological features and motor skills of examined children with severe handicap showed that boys are characterized with statistically significant greater height values.

In evaluation of motor skills results, the greatest differences, with lack of statistically significant dependences, were observed among girls in lower limbs explosive strength test. On the other hand in boys group those differences concerned upper limbs strength test and abdominal muscles strength. In both, girls and boys groups, regardless of mental handicap level, the lowest results were observed in flexibility test. Most results of girls' motor skills were lower than boys'.

DISCUSSION

Each disability, including mental handicap, results in negative effects in all areas of children's and teenagers' development. It also draws a negative picture of self-acceptance. In a child with a motor organ defect, resignation and obedience toward the misfortune influencing the child's life are observed. Self-acceptance is in this view a way to overcome a shame and inferiority complex. Motor inefficiency accompanying a handicapped child unable freedom in acting and comfort in moving. This state defines child's relations with objective and social environment. Improving intellectually handicapped children's motor abilities helps to enhance child's participation in social life to some degree, although never fully. Carolyn O'Brien (20) emphasizes that original aim of sport and physical activity of mentally handicapped children, is to improve and strengthen motivation in par-

Table 2. Sex dependent average level of examined boys' and girls' morphological features and motor skills.

Feature (skill)	Measure	Sex		F	W _d
		Girls	Boys		
Body mass (kg)	\bar{x}	43.71	47.08	2.015	0.197
	s _x	15.85	17.06		
Height (cm)	\bar{x}	143.7	150.7	12.046*	0.474
	s _x	12.69	14.76		
BMI	\bar{x}	20.65	20.32	0.175	-0.060
	s _x	5.565	5.500		
1. Lower limbs explosive strength (cm)	\bar{x}	66.61	73.24	1.235	0.148
	s _x	37.32	44.63		
2. Abdominal muscles strength (numbers of bending forward)	\bar{x}	5.167	7.402	8.844*	0.385
	s _x	4.374	5.804		
3. Flexibility (cm)	\bar{x}	-0.089	-0.184	0.004	-0.010
	s _x	12.03	9.10		
4. Speed (s)	\bar{x}	11.84	9.20	3.767*	-0.609
	s _x	13.67	4.33		
5. Upper limbs strength (cm)	\bar{x}	225.0	307.8	17.462*	0.507
	s _x	93.9	163.2		

* – statistically relevant value F ($\alpha = 0.05$).

Table 3. Morphological features' and motor skills' average level among children with moderate handicap depending on sex (basic statistical measures and variance analysis results).

Feature (skill)	Measure	Sex		F	W _d
		Girls	Boys		
Body mass (kg)	\bar{x}	41.88	45.64	1.846	0.220
	s _x	14.26	17.08		
Height (cm)	\bar{x}	143.3	149.6	6.422*	0.418
	s _x	13.27	15.06		
BMI	\bar{x}	19.84	19.97	0.022	0.023
	s _x	4.114	5.594		
1. Lower limbs explosive strength (cm)	\bar{x}	70.63	85.63	4.513*	0.346
	s _x	36.72	43.33		
2. Abdominal muscles strength (numbers of bending forward)	\bar{x}	5.316	8.325	10.364*	0.502
	s _x	4.412	5.991		
3. Flexibility (cm)	\bar{x}	1.956	0.031	1.407	-0.255
	s _x	11.45	7.54		
4. Speed (s)	\bar{x}	10.30	8.47	2.418	-0.431
	s _x	9.099	4.237		
5. Upper limbs strength (cm)	\bar{x}	236.1	335.6	15.830*	0.578
	s _x	92.3	171.9		

* – statistically relevant value F ($\alpha = 0.05$).

Table 4. Children's with severe handicap average level of morphological features and motor skills depending on sex.

Feature (skill)	Measure	Sex		F	W _d
		Girls	Boys		
Body mass (kg)	\bar{x}	47.59	50.19	0.342	0.154
	s _x	18.48	16.81		
Height (cm)	\bar{x}	144.7	153.0	6.283*	0.592
	s _x	11.55	14.01		
BMI	\bar{x}	22.36	21.07	0.637	-0.243
	s _x	7.613	5.288		
1. Lower limbs explosive strength (cm)	\bar{x}	58.11	46.46	1.620	-0.333
	s _x	37.83	34.91		
2. Abdominal muscles strength (numbers of bending forward)	\bar{x}	4.852	5.405	0.220	0.113
	s _x	4.356	4.879		
3. Flexibility (cm)	\bar{x}	-4.41	-0.65	1.513	0.315
	s _x	12.30	11.90		
4. Speed (s)	\bar{x}	15.38	10.73	1.803	-1.115
	s _x	20.52	4.17		
5. Upper limbs strength (cm)	\bar{x}	201.4	247.5	2.600	0.370
	s _x	94.6	124.5		

* – statistically relevant value F ($\alpha = 0.05$).

ticipating in various forms of movement, gaining motor independency and social acceptance at the same time. To be successful, these types of programs must be systematic and continuous.

Obesity in mentally handicapped children plays an important part in restricting physical activity. Its negative influence is described by Frey and Chow (21), who established, that 20% from 444 examined people is overweighted. Melville, Cooper, McGrother and others emphasize that in case of overweight and obesity it is important to react early, for these states have influence on mortality and incidence of various diseases. It is especially important for individuals with Down's syndrome (22).

Lewis and Fragala (23) describe the influence of home exercise program on cardio-respiratory system, strength and muscles strength endurance as well as on motor skills and BMI. After 6 weeks of exercise program in 10,5-year-old girl with Down's syndrome, positive changes were observed in cardio-respiratory system and muscles strength. However no changes in BMI were noticed, which seems to be quite obvious considering observation time during research.

Results of the research on interdependencies between motor skills, physical fitness and obesity among South Korean teenagers with mild and moderate handicap were described by Foley, Harvey, Chun and Kim (24). The study, carried out on 321 individuals, showed that physical fitness influences directly obesity reduction. Authors of this study emphasize the healthy role of physical fitness and motor skills in a fight with obesity (24).

Even children with heavy and complex psychomotor disorders can be instituted to special programs improving motor skills, as proved in research carried out among children from Special Education Facilities in the Netherlands (25).

Variance analysis of own tests results showed that boys are significantly higher, they have stronger upper and lower limbs as well as greater endurance of abdominal muscles and they are faster. Boys had higher average values of sex dimorphism in motor skills than girls. Boys also dominated girls in height and body mass. Thus, dimorphic differences appear also in population of intellectually handicapped people. Only in flexibility and dimorphism index values evaluation, boys and girls had similar results.

Sex significantly differentiates boys in their height, as shown on a group with moderate and severe mental handicap. Boys were characterized by bigger body mass than girls. They were also better in measured motor skills. There were statistically significant differences in the strength of upper and lower limbs as well as abdominal muscles.

Girls with severe handicap were heavier and taller from girls with moderate handicap of around 2 kg and 2 cm in average. Boys were better in motor skills than girls, except of explosive strength of lower limbs, where girls achieved better results of around 2 cm in the long jump test. Value of sex dimorphism index for body height was statistically significant in case of boys' height.

Evaluation of morphological measures of mentally handicapped people was conducted in comparison to

healthy children from Krakow city macroregion in Poland (26).

Mean age of mentally handicapped boys and girls was 15 years-old, thus the differences in arithmetical means for height and body mass were analyzed for this age group.

Levels of examined morphological features: height, body mass in the group of mentally handicapped girls was delayed in comparison to the population of healthy girls. The differences in height were over 20 cm to the disadvantage of examined girls. Handicapped girls were lighter for about 11 kg. In the group of boys differences were also important. Examined boys were 21cm smaller and 9 kg lighter than their peers from healthy Polish population. These differences however should be treated as indicative. They would be different if the age of mentally handicapped people wasn't taken as an average and abundance of examined group was equal or approximate comparing to examined Polish population.

While evaluating physical fitness components (examined motor skills), as a stimulating and accumulative effect of spontaneous and directed motor activity, physical activity of mental handicapped was pointed out. This activity was presented in motor tests, of which results unveiled motor skills of mentally handicapped.

Obtained results should be investigated in the aspect of psychomotor health of intellectually handicapped children. Generally, concept of health-related fitness (H-RF) is defined as a state of physical and physiological features of the body, determining the risk of premature appearance of diseases connected with passive life-style (27). H-RF components can be more or less effectively influenced by physical exercises and physical activity becomes the key factor to health-related fitness (27, 28). Wiesław Osiński, a consistent promoter of H-RF concept in Poland, claims that this concept should become a base for modern system of physical education (29). Considering opinions of all mentioned explorers and own results, physical education classes in special schools should be oriented to children's health and not only to increase results from physical fitness tests. Excessive physical effort can decrease child's motivation to participate in increased physical activity and it reduces joy and positive experience from taking part in physical education class. Gaining certain physical fitness should not represent a final product of physical effort, which therefore should be treated as a mean to obtaining health-related fitness (30). Such physical fitness should be taken care of, especially in case of child with mental handicap.

CONCLUSIONS

1. Sex of intellectually handicapped differentiates their height, strength and speed.
2. Girls and boys with moderate handicap have lower BMI than peers with severe handicap.
3. Girls and boys with severe handicap are significantly higher and heavier than moderately handicapped.
4. Motor skills level depends on sex and level of mental handicap.
5. Boys in average have better motor skills, which are confirmed by better and higher results in physical fitness.

6. Sex does not differentiate flexibility, which is similar in results regardless of intellectual handicap level.

7. The biggest difference in moderately handicapped boys motor possibilities appeared in the strength of upper limbs and abdominal muscles endurance strength, whereas for girls – in explosive strength of lower limbs.

8. Intellectually handicapped are not deprived of motor skills. These skills need to be increased, improving health and enabling handicapped individuals to achieve self-acceptance and better life in society. □

The authors would like to thank the children and parents who participated in the study. Additionally, the authors thank the support of Anna Kołodziej who assisted during data collection.

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Received: 15.04.2011
Accepted: 30.05.2011

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