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THE LINK BETWEEN PHYSICAL DEVELOPMENT AND MOTOR SKILLS OF RURAL STUDENTS IN ROMANIA

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Abstract

The origin of the family environment and exercise are external factors that can influence the growth and development of children and young people. This study was conducted on a sample of 250 fifth grade students from a rural area in Romania. The evolution of anthropologic indicators and motor skills were assessed with the help of the push-up evaluation. The height indicated a mean value in 45.2% and 4.0% in youth with pathological values. Body weight also fit into average values in 56.8% with 11.6% students with pathological values. Harmonious development appears in 48% of the cases with 13.2% students with pathological values. The 10 mandatory push-ups could be done only by 42.4% of the sample. The correlation between the diagnosis of physical development and motor skills highlights statistically significant differences among girls at a p< 0.01 (f =9, χ^2=22.235). It can be concluded that careful monitoring is required in order to be able to quickly correct any deviation from the normal evolution.

Keywords: Rural children, physical development, motor skills development.

1. Introduction

The growth and development of children and youth are two processes that suffer from both internal (genetic) and external (environmental) factors. Under the category of external factors enter into the geo-climatic conditions, diet, socio-economic conditions, family origin, state of health, exercise and pollution (Radić, Božić-Krstić, Pavlica & Tegako, 2017).

The first aspect to be studied is the one represented by the environment of the family, whether it is urban or rural. Except the population of North America and Australia, there are differences between the development of children in urban areas and those in rural areas (Eveleth & Tanner, 1990). The differences are large, so it is necessary to achieve various benchmarks according to the origin of the family environment. Differences of growth/development of children and youth from rural or urban areas appear due to different socioeconomic levels, evidenced in a more balanced diet in urban areas, the best of medical care, and better access to education for children in cities. There are complex factors that influence the better development of urban children, but none has been precisely confirmed (Stănescu, Stoicescu & Bejan, 2018). Different development rates are seen in a slow physical growth (lower values for height and weight) and a later puberty maturation of children and young people in the villages.

Motor ability is a complex reaction to the environmental stimuli including, in a characteristic unit, several elements: psychomotor skills, as a natural psychophysical endowment of the motor-athletic skills, influenced by a multi-level maturity of the functions and by practice, and accompanied by internal motivational factors. Capacity refers to the backround pre-existing elements of a skill, with depend of its natural development, on the educational formation, even on practice (Abalaşei, 2012).

Another important factor is the one represented by daily exercises. For students in the rural area physical activity is, theoretically a constant of daily life, because they are actively involved in the daily household chores. (Gavăt, Albu & Petrariu, 2006).

Currently, however, as farming becomes increasingly mechanized, there is the possibility of a modest involvement of students in the various activities of the rural environment, which can orient the sedentary.

2. Problem Statement

For teachers of physical education and coaches, motor skills are essential in the student orientation towards sport performance. The selection of young students for sports is based on a variety of criteria represented by the medico-biological, biochemical, physiological and psychological aspects (Stoian, 2017). The selection of young people for the pursuit of sports performance requires also the knowledge of the optimal age from which it is possible to start the preparation and their initial motor skills. In this respect, we focused the study towards the anthropometrical assessment indicators of young people and their capabilities by examining the number of push-ups performed.

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3. Research Questions

Is the physical development of children from the study batch adapted to the national standards?

Is there a large percentage of children with a pathological weight (greater than +3 sigma)?

What is the percentage of children with harmonious development and those with disharmonious development?

Is disharmonious development with excess weight dominant?

Are the motor skills of the children examined within normal limits, in accordance with the national standards?

4. Purpose of the Study

This study aims to identify the physical development of the children of the study batch and compare them with national reference values. It also seeks to assess the differences between the physical development of girls and boys in terms of their motor skills. Additionally, the study attempts to identify the frequency at which the disharmonious development appears with excess weight compared with the disharmonious development with low weight. The study also attempted to identify the correlation between the diagnosis of physical development and motor skills of the children in the study batch.

5. Research Methods

The study was conducted on a sample of 250 children from the 5th grade in schools from a few villages in Suceava County, Romania. The study was conducted in Suceava County, which is a mountainous area where socio-economic level of the families align with the physical development of the children. The villages where the study was conducted were chosen randomly. Children in the 5th grade were selected because at this age they can be oriented towards sports performance. 133 boys (53.2%) and 117 girls (46.8%) between the ages of 10 and 13 were examined in this study.

The anthropometric assessment was conducted, and the sample were requested to do push-ups exercise. Anthropometric measurements were represented by the height and body weight evaluation of students. The height was assessed using a meter (a rod graduated annexed medical balance), and the weight was obtained by weighing with scales. The values obtained were compared to the international standards reference (WHO, 2007). National standards are differentiated according to age, gender and origin of the family environment (urban/rural). The mean and the standard deviation are calculated, to show that the sigmatic ranges and differentiation of values are normal. If an individual's height and weight are within the range of - mean sigma and +mean sigma, the values are considered average (Bardov, 2009). Those contained within +mean sigma and +2 mean sigma are considered high and within +2 sigma and +3 sigma are considered very high. Within the - mean and -2 mean sigma, the values are considered low and between -2 sigma and -3 mean sigma, the values are considered very low. Measurements of less than mean -3 sigma points are considered pathological and can indicate dwarfism or malnutrition. The largest mean, +3 sigma is considered pathological and can indicate gigantism and obesity. To prevent the dispersion of the results, values of low/very low and high/very high were collapsed into a single evaluation (Gavăt, Albu & Petrariu, 2006). The values of the height and weight allow diagnosis of the children's physical development. If an individual's height and weight are in the same range, the development is harmonious. If one's height and

weight are placed in different sigmatic intervals, the development is disharmonious with plus (excess) or minus (low) weight versus height.

The children were requested to realize push-ups. Push-ups were chosen because national standards are available to compare with in order to clarify the motor abilities of the children. The interpretation of the results was done starting from control samples for 5th graders. If the boys did less than 4 push-ups, a vote under 5 was recorded; a vote of between 5 and 7 required the achievement of 4 to 9 push-ups; a vote between 8 and 9 was achieved with 10-15 push-ups and for the maximum vote (10) 14 push-ups or more. For girls, for the 5 vote had to make 2 push-ups, a vote between 5-7 for 2-4 push-ups, a vote between 8-9 for 5-6 push-ups and for the maximum vote (10) for 7 push-ups or more. Statistical processing of the results was done using the Pearson Chi Square test.

6. Findings

The study is oriented on two main directions of anthropometric assessment and physical exercise.

Measurements of height falls mostly at a high/very high levels (48.4%) and environment (45.2%). 4.0% students fall into pathological values of height, where levels exceed the average + 3 sigma (table 01).

Table 01. Framing in different sigmatic classes of examined students

Sex	Framing in different sigmatic classes of examined students				
	Very low/low	Average	High/ Very high	Pathological	Total
Boys	1	61	62	9	133
Girls	5	52	59	1	117
Total no.	6	113	121	10	250
%	2.4	45.2	48.4	4.0	

Sex differences are calculated with statistical significance at p<0.05, (f =3, χ^2=8.951) and an increased number of male children exhibiting pathological values of height must be carefully monitored. The female children aged 10-11 years exhibit pre-puberty growth (which may explain the emergence of pathological heights) while the male growth at pre-puberty only appears after the age of 12.

The children's measurements of body weight falling in the dominant averages (56.8%), can be considered normal but 11.6% with pathological values (above average 3 sigma) needs careful attention. (Table 02).

Differences are shown to be statistically insignificant for the different genders (p>0.05, f =3, χ^2=4.309) which represents a wake-up call.

Table 02. Body weight

Sex	Body weight				
	Very low/low	Average	High/ Very high	Pathological	Total
Boys	0	73	43	17	133
Girls	3	69	33	12	117
Total no.	3	142	76	29	250
%	1.2	56.8	30.4	11.6	

The diagnosis of physical development allows assessment of correlation between the children's height and body weight. The results obtained is troubling because only 48% children have a harmonious development. Contrary to what is claimed in the media regarding the existence of increasingly numerous cases of obese children, the children examined in this study exhibited underdevelopment with minus gain (26.4%) is dominant over the plus gain (12.4%). The percentage of 13.2% students with a pathological development is worrying (table 03).

The calculated differences according to sex are not significant statistically. The diagnosis of physical development which allows assessment of correlation between height and body weight of the children reveals a cause for concern as only 29.8% exhibit a harmonious development. Contrary to media claims regarding the existence of increasingly numerous cases of obese children, the children examined in this study exhibited disharmonious with minus weight (16.4%) is dominant over the plus weight (7.7%). 8.2% of the sample with a pathological development is worrying (table 03).

The calculated differences according to sex is not statistically significant ($p > 0.05$, $f = 3$, $\chi^2 = 1.364$) which is an element of concern related to the growth and development of young girls at that sharp increase in puberty which is obvious.

Table 03. Assessment of physical development

Sex	Physical development assessment				
	Harmonious	Disharmonious with -weight	Disharmonious with +weight	Pathological	Total
Boys	65	32	16	20	133
Girls	55	34	15	13	117
Total no.	120	66	31	33	250
%	48.0	26.4	12.4	13.2	

The second aspect is the least studied motor skills of the sampled children. The motor skills of the children were represented by the number of push-ups realized and comparing the result with the notation scales. The results showed that 9.2% obtained a vote below 5 meaning that some managed a few push-ups while others could not complete any. In contrast, almost half (42.4%) the children did the maximum number of push-ups according to the standard scoring. In rural areas, specific physical agricultural based activities is a habit for these children. (Table 04). Sex differences were found to be statistically insignificant ($p > 0.05$, $f = 3$, $\chi^2 = 2.956$), so there are no differences between boys and girls in terms of the ability to obtain the maximum vote.

Table 04. Votes received by the students according to the number of push-ups

Sex	Push-ups				
	Under 5	Vote 5-7	Vote 8-9	10 (maximum vote)	Total
Boys	9	38	27	59	133
Girls	14	38	27	59	117
Total no.	23	76	45	106	250
%	9.2	30.4	18.0	42.4	

For physical education professionals, the correlation that exists between the physical development of the child and his/her motor skills in terms of the number of a particular exercise in a specific time interval

(in this case, push-ups) is extremely important. Obviously, this correlation is only the starting point for guiding a young person to sport performance. Children who could manage a limited number of push-ups and falling especially in pathological development is a great cause for concern. Children who achieved the maximum vote for push ups exhibit an especially harmonious development (table 05) and reflects a positive trend in the physical development of these children.

Table 05. Correlation between physical development and number of push-ups

Votes according to the number of pus-ups	Physical development diagnosis				
	Harmonious	Disharmonious with -weight	Disharmonious with +weight	Pathological	Total
Under 5	7	5	1	10	23
5- 7	36	17	12	11	76
8-9	20	14	7	4	45
10	57	30	11	8	106
Total	120	66	31	33	250

The calculated differences are statistically significant at a $p<0.01$ ($f=9$, $\chi^2=24.416$) according to the specific distribution of the number of push-ups according to the diagnosis of physical development of the children in the study group.

Differences of body composition between male (dominant muscle masses) and the female (dominant adipose tissue) were noticeable; hence, the discussion will be presented according to the gender.

A uniform distribution among the males is noticeable of the cases noted below 5 depending on the diagnosis of physical development. There is also a relatively balanced distribution of children with the maximum vote according to the diagnosis of development where the calculated differences are insignificant statistically ($p>0.05$, $f=9$, $\chi^2=9.672$) (table 06).

Table 06. Correlation between physical development diagnosis and physical abilities for boys

Votes according to the number of pus-ups	Physical development diagnosis for boys				
	Harmonious	Disharmonious with -weight	Disharmonious with +weight	Pathological	Total
Under 5	2	3	0	4	9
5- 7	19	7	6	6	38
8-9	13	8	3	3	27
10	31	14	7	7	59
Total	65	32	16	20	133

Among the girls, there is a larger concentration of those with a vote of less than 5 leading to a diagnosis of pathological physical development. The sharp increase in height was not associated with a proper development of muscle mass, so the significant statistical differences are calculated at a $p < 0.01$, $p< 0.01$ ($f=9$, $\chi^2=22.235$) (table 07).

Table 07. Correlation between physical development diagnosis and physical abilities for girls

Votes according to the number of pus-ups	Physical development diagnosis for girls				
	Harmonious	Disharmonious with -weight	Disharmonious with +weight	Pathological	Total
Sub 5	5	2	1	6	14
5- 7	17	10	6	5	38
8-9	7	6	4	1	18
10	26	16	4	1	47
Total	55	34	15	13	117

The processes of growth and development of children must be carefully tracked to quickly highlight any deviation from normal evolution. An important aspect is the one linked to the evolution of body segments leading to uneven development known as the scheme of Godin: upper limb growth alternated with those of lower limbs, trunk growth alternated with that of the lower limbs (Luca, Badrajan, Savu & Leasevici, 2015).

Another important aspect to consider is the existence of differences between the time of the occurrence of changes in adolescent girls (starting at 10 years of age) and boys (starting from 12 years old) (Gavăt, Albu & Petrariu, 2006). In the children examined, the puberty leap growth is manifested in the females but not for the males, although the development of factor indicators (height and weight) is pretty big, and there are numerous cases of pathological values.

Monitoring physical development of adults is done using the body mass index (Rada, 2016). Child growth and development have a number of features that can be appreciated only with specific benchmarks known as the national standards (Albu & Rada, 2014).

National benchmarks highlight the two phenomenon of accelerated population increase represented by different urban/rural development rates (Gavăt, Albu & Petrariu, 2006; Crăciun & Găitan, 2017). Accelerated growth implies an evolution of physical parameters and an appearance of early puberty compared with values obtained 40-50 years ago (Misaki, 2013). Anthropometric measurements made systematically highlight a second population phenomenon represented by different urban/rural development rates. Public health experts have called attention to the situation of children from vulnerable environments in our country such as rural environments where family income often depends only on agricultural production. Young people from families with a precarious socioeconomic level have reduced opportunities of access to health, education and social services (Sonenstein, 2014) which may affect optimal physical development.

Within the reference values from Romania in 1999, this is obvious when we compare between average levels of urban and rural areas. At 11 years, urban boys' average height was 142.645 cm but only 137.5 cm in rural areas, while the weight in urban areas was 35.266 kg compared to 30.8 kg in rural areas. The situation is similar to female height which decreases from 143.67 cm in urban areas to 138.5 cm in rural areas and the weight from 35.332 kg in urban areas to 31.4 kg in rural areas (Albu & Rada, 2014).

In another study conducted on 5th grade rural children from Vrancea and Iasi counties, the percentage of students with high pathological values was only 2.12% and 8.2% in weight (Onose, Hodorcă & Albu, 2016). The situation of the children in this study is not problematic but requires careful monitoring. There is a possibility of some increase in the manifestation of height leaps, which explains the presence of

the large number of children with high/very high and pathological heights. Subsequent growth can become less intense, so the children can attain the medium or high/very high levels but are not deemed pathological.

The body weight in the examined children is frequently placed at high/very high and pathological values. These values must be tracked carefully, especially among the girls, as it could lead to a desire to resort to slimming cures to be able to identify with the current exaggerated ideal of beauty (Neumark-Sztainer, 2015). Excessive weight loss must be carefully monitored by the family and medical staff in case of serious nutritional imbalances. The results indicate low/very low body weight among the girls that are not present among the boys. This result demonstrates the emergence of concerns for controlling body weight among the females.

Control of body weight may be achieved by practicing systematic exercise (Yap, 2017). However, in a study conducted in the Republic of Moldova, 19.3% young people in rural areas were found to be not interested in practicing physical exercise (Țigănaș, Zepca & Zaporojan, 2015), although there is a growing interest in intense physical activity for boys compared with girls.

The last aspect is the one related to the correlation between physical development and the number of push-ups according to specific scoring standard for 5th grade. All differences are statistically significant and point to a concentration below 5 votes in children with pathological values of physical development. The differences are noticeable among girls who manifest puberty growth leaps and who already exhibit dietary restrictions to fulfil particular beauty stereotypes. Such differences do not arise in males where puberty changes are not yet apparent and where concern for the body appearance do not really exist, at least not at this age group.

7. Conclusion

There is an increased frequency to pathological development among the children in this study. Although, it may be attributed to a growth spurt or an anthropometric pathologic evolution, the motor skills are quite underdeveloped and there are children who could not do push-ups or manage only 1 or 2.

The results of this study can represent a starting point for physical education teachers and medical staff to undertake interventions to correct this disharmonious development. Physical education teachers can guide children towards a steady routine of physical activity while medical professionals can trace any major changes to the physical development of children and youth.

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