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Anthropology Open Access

Albu A, et al. Anthropol Open Acc: AOAP-129

Research Article

DOI: 10.29011/AOAP-129/ 100029

Physical Development and Eating Habits for a Group of Adolescents from Suceava County in Romania

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Citation: Albu A, Badaluta A, Dima F (2018) Physical Development and Eating Habits for a Group of Adolescents from Suceava County in Romania. Anthropol Open Acc: AOAP-129. DOI: 10.29011/AOAP-129/ 100029

Received Date: 17 August, 2018; **Accepted Date:** 05 September, 2018; **Published Date:** 14 September, 2018

Abstract

Introduction: Growth and development are processes specific to the early years of a person's life. It is necessary to carefully monitor the evolution of children in order to get involved when needed.

Materials and Method: The study was carried out on a group of 193 students from two high schools in the city of Suceava. The physical development and eating habits of the students were assessed.

Results and Discussions: Height and weight are mostly at an average level. The diagnosis of physical development reveals the existence of 18.65% of young people with disharmonious development with decreased weight and 22.27% of students with increased weight. There are 12.43% of young people who estimate their body weight as being too low and 20.20% that estimate having too much weight. Fruits are present in menus, especially 4-7 times per week (62.17%) as well as bread (70.46%).

Conclusions: Physical development of students is sometimes deficient; there are overweight young people but also underweight teenagers.

Keywords: Height; Malnutrition; Obesity; Weight

Introduction

Growth and development are the two physiological processes that characterize the first years of a person's life. Growth is the quantitative process of accumulation of organic matter, while development is the qualitative process that simple structures and turns them into complex ones, specific to the adult.

While interpreting these processes, we must take into account three elements represented by: how to achieve growth/development, what is normal and the relationship between heredity and the environment. Growth can be linear or in leaps. There are periods in which growth is slow (almost imperceptible) and periods where there is an increase in growth rates (pubertal growth leap). Another essential aspect is that of defining what normal is. We must use the average reference values with which young people are assessed. In this context, we do not take into account the uniqueness of each person, which leads to the possible matching of children with abnormal or pathological values. Thus the connection between heredity and the environment must be correctly understood and interpreted [1]. A particular element is the one related to the body height that the child can reach. Height is genetically determined, as confirmed by the positive relationship between the height of the child and that of the parents. A child can reach the maximum height value determined by his/her genetic code only in optimum living conditions.

Obtaining reference values allows the correct assessment of the particularities of the population represented by the phenomenon of accelerated growth and the different development rates based on the family's background [2,3]. Accelerated growth (the secular trend) was highlighted by periodic measurements at certain time intervals [4]. In Romania the measurements were made at 7-year intervals starting with 1957. In 15-year-old young women the average height in 1957 was 157.4 cm. It reached 160.5 cm in 1978 and 161.6 cm in 1999. In the male sex the evolution was from 162.1 cm (1957) to 168.3 cm in 1978 and 167.3 cm in 1999. There is an important population phenomenon represented by an obvious evolution between 1957 and 1978 followed by a slow one [5]. Body weight had the same evolution in both genders. In girls, in 1957 the average weight at 15 years was 48.6 kg; it increased to 52.2 kg in 1978 and reached 51.8 kg in 1999. In boy's evolution was from 49.4 kg in 1957 to 55.5 kg in 1978 and 54.5, kg in 1999 [6].

The second important population aspect is related to the different evolution based on the urban/rural family environment. In 1957, at the age of 15, in the female sex the average values for height were 157.4 cm in urban areas and 152.8 cm in rural areas, and in weight they ranged from 48.6 kg (urban) to 44.8 kg (rural). For young men, height ranged from 162.1 cm in urban areas to 153.2 cm in the countryside, and weight ranged from 49.4 kg to 42.6 kg. These differences are maintained in the 1999 standards where female height averages at 15 years of age are 161.6 cm in urban areas and 157.0 cm in rural areas and 51.8 kg and 49.0 kg respectively. The male variation is between 167.3 cm (urban) and 160.3 cm (rural) and from 54.5 kg to 48.9 kg for weight. Thus it is important to note that we cannot use urban reference values to assess the state of rural students and vice versa [7].

Lately, the situation has become even more difficult because the image of the self has been influenced by modern life, especially by mass-media. Young people, and most of all young women, try to identify with the current "beauty ideal" represented by the slim woman (the supermodel) and young men want to mimic the idea of the tall man with very well-developed muscles. Healthy young people have a balanced body appearance but are unhappy because they do not fit in the generally accepted pattern. In this context, it is possible to see cases of exaggerated weight loss treatments (especially in girls) which can often cause severe health problems [8].

Objectives of the study: evaluation of the physical development of students in the studied group; differentiated interpretations of results based on sex, high school and age (school years 10 and 11); establishing the diagnosis of physical development and the correlation between it and the way students perceive their own body weight; assessing the eating habits of students.

Material and Methods

The study was carried out on a group of 193 students from the Economic College (100 adolescents) and from the Technical College (93 adolescents) in the city of Suceava. These are pupils in the 10th (92) and 11th (101) grades, aged between 15 and 19 years. 74 boys and 119 girls were examined. For these young people, physical development and eating habits were quantified.

Physical development was assessed by measuring the height and body weight of the student and comparing it to the national reference values known as national standards. These are obtained by effectively measuring a statistically significant number of pupils in our country. Average valuesare calculated based on gender, age and family background. The average values and the calculated standard deviations allow the delineating of sigma intervals. The values between the average + sigma and average – sigma are considered average values. The ones between average + sigma and average +2 sigma are high values, and those in the average +2 sigma and average +3 sigma range are very high values. At the opposite end, are the small values (between average - sigma and average -2 sigma) and very small values (between average -2 sigma and average -3 sigma). Reference values also allow for defining normal or pathological development because all the values between -3 sigma and +3 sigma are considered normal. The ones below -3 sigma and above +3 sigma are pathological, indicating (for height and weight) nanism and undernutrition, and gigantism and obesity respectively. In order to avoid a large dispersion of results, we will perform the interpretation on very small/small, average and large/very large values [1].

The correlation between height and body weight allows the diagnosis of physical development to be determined. It is important that at a certain body height (genetically determined) there is also adequate body weight [9]. If the height and weight are placed in the same sigma range, the development is harmonious with very small, small, average, large and very large values. If height and weight are placed in different sigma intervals, development is disharmonious with increased or decreased weight.

We are also interested in the way we perceive our own body weight. In order to get information about this aspect, the student was asked to answer the question: "You think your weight is: just fine; too big; too small".

Food habits were evaluated using a weekly food intake questionnaire. Fruit and bread consumption was assessed. Possible responses are: zero; 1 time; 2-3 times; 4-7 times (per week). Interpretation of the results was done according to the sex of students, high school and school year. The results were processed using Pearson's CHI-Squared Test.

Results

The assessment of physical development was guided in three main directions, based on pupils' gender, high school and school year. We evaluated the results taking into account the different development rates based on gender and age. We also evaluated the different outcomes on the community to get to know the general characteristics of adolescents in the Suceava area.

The height of the examined students is mostly within the average values (68.91%), resulting in a balanced growth of the students in the studied group (Table 1).

Sigma ranges	Very small/ Small	Average	Big/ Very big	Total
	Distribution of cases based on sex			
Masculine	9	47	18	74
Feminine	20	86	13	119
Total	29	133	31	193
%	15.02	68.91	16.06	
	Distribution based on high school			

Economic	14	65	21	100
Technical	15	68	10	93
	Distribution based on school year			
10th	16	62	14	92
11th	13	71	17	101

Table 1: Height classification in sigma ranges.

Differences calculated by sex are statistically significant ($p<0.05$, $f=2$, $\chi^2=6.210$) and reveal a height increase in boys compared to girls. In young men, very small/small values are present in 12.16% of cases, while in young women they are present in 16.80% of cases. At the same time, the big/very big values are present in 24.32% of boys and 10.92% of girls. It is a result that must be known because in young women, at 15-16 years of age, growth slows down, while boys continue to experience an intense growth.

Based on the high school, the calculated differences are statistically insignificant ($p>0.05$, $f=2$, $\chi^2=3.712$) and show similar results of growth/development patterns between the two schools.

When considering school years, the calculated differences are statistically insignificant ($p>0.05$, $f=2$, $\chi^2=0.649$) which should be carefully interpreted because in grade 10 (15-16 years), especially in males the growth is quite intense, while in the 11th grade (17-18 years) growth process becomes slower.

The weight of the pupils in the studied group is mostly average (67.87%). Our attention is drawn to the 1.03% of young people with pathological values for body weight and who should be directed towards a specialized medical examination. We note the presence of 13.47% of pupils with very small/small values and of 17.61% of adolescents with high values of body weight (Table 2).

Sigma ranges	Very small/ Small	Average	Big/ Very big	Total
	Distribution of cases based on sex			
Masculine	10	47	16	1
Feminine	16	84	18	1
Total	26	131	34	2
%	13.47	67.87	17.61	1.03
	Distribution based on high school			
Economic	10	68	21	1
Technical	16	63	13	1
	Distribution based on school year			
10th	15	61	15	1
11th	11	70	19	1

Table 2: Weight classification in sigma ranges.

Students with very small/small or high/very high values for body weight will need to be monitored to assess the subsequent evolution. We cannot make a diagnosis of malnutrition or overweight from the first examination because the high or low weight might be due to an upcoming or recent growth spurt and not due to a bad diet or a pathological entity. Differences calculated by gender are statistically insignificant ($p>0.05$, $f=3$, $\chi^2=2.119$) which is surprising when considering young women for whom identifying with the current beauty ideal is very important. Between the two high schools the results reveal statistically insignificant differences ($p>0.05$, $f=3$, $\chi^2=3.247$) and the same is true between the two school years ($p>0.05$, $f=3$, $\chi^2=1.280$).

The diagnosis of physical development allows for the assessment of the correlation between height and weight. Harmonious development is present in 58.03% of cases, an unsatisfactory result because we are talking about young people at an age where growth rates are slowing down (Table 3).

Diagnosis	Harmonious	Disharmonious with decreased weight	Disharmonious with increased weight	Pathological
	Diagnosis of physical development based on sex			
Masculine	40	17	16	1
Feminine	72	19	27	1
Total	112	36	43	2
%	58.03	18.65	22.27	1.03
	Distribution of cases based on high school			
Economic	56	19	24	1
Technical	56	17	19	1
	Distribution of cases based on school year			

10th	48	21	22	1
11th	64	15	21	1

Table 3: Diagnosis of physical development.

Our attention is drawn by the 18.65% of students with a disharmonious development with decreased weight and the 22.27% with increased weight. Medical literature insists greatly on young people with increased weight, neglecting those with decreased weight. Identifying with the current beauty ideal imposes a drastic control of body weight, so much so that we can encounter slim and very slim teenagers. The results obtained when considering gender are worrying because the insignificant differences obtained ($p>0.05$, $f=3$, $\chi^2=1.627$) show similar level of concern of the two sexes for controlling body weight. Differences calculated by high schools are statistically insignificant ($p>0.05$, $f=3$, $\chi^2=0.428$) being a phenomenon present in the majority of young people. Differences obtained by school years are statistically insignificant ($p>0.05$, $f=3$, $\chi^2=2.843$).

The diagnosis of physical development directs specialists towards a situation of normality, underweight or overweight. It is an element that is not available to young people, which is why it is important to know how they perceive their own body weight. This is considered to be "just fine" by 67.35% of students. There are 20.20% of "too big" responses but also 12.43% of "too small" responses (Table 4).

Body weight	Just fine	Too big	Too small
	Perception of body weight based on sex		
Masculine	51	12	11
Feminine	79	39	24
Total	130	39	24
%	67.35	20.2	12.43
	Distribution based on high school		
Economic	65	22	13
Technical	65	17	11
	Distribution based on school year		
10th	58	20	14
11th	72	19	10

Table 4: Perception of body weight in students.

Based on gender, the calculated differences are statistically insignificant ($p>0.05$, $f=2$, $\chi^2=1.455$) which is surprising because male individuals are usually less interested in this aspect. Differences calculated by high schools are statistically insignificant ($p>0.05$, $f=2$, $\chi^2=0.524$) as well as those by school years ($p>0.05$, $f=2$, $\chi^2=1.809$).

We will try to quantify the perception of body weight with the help of the physical development diagnosis. There are 79 young people (40.93%) with discordances between their own perception and the reality quantified by the physical development diagnosis (Table 5).

Body weight	Just fine	Too big	Too small	Total
Harmonious	83	13	16	112
Disharmonious with decreased weight	25	3	8	36
Disharmonious with increased weight	21	22	-	43
Pathological	1	1	-	2

Table 5: The relationship between body weight perception and physical development diagnosis.

Our attention is drawn by the 13 young people (6.73%) who have a harmonious development, but who consider themselves too fat and the 25 students (12.95%) who consider their body weight to be just fine, although they are developed disharmoniously with decreased weight.

Food habits are assessed using the weekly food intake questionnaire. We insist on fruit because a national program has been launched in our country which offers fruit in schools. The second item we will focus on is bread because the tendency is to completely remove it from menus when going on weight loss diets.

Fruits are present in students' menus especially 4-7 times (62.17%) or 2-3 times (23.32%) per week. In 85.48% of situations, fruit consumption is adequate, so supplementation is not required (Table 6).

Weekly intake	Zero	1 time	2-3 times	4-7 times
	Weekly intake of fruit based on gender			
Masculine	1	8	20	45
Feminine	4	15	25	75
Total	5	23	45	120

%	2.59	11.91	23.32	62.17
	Intake based on high school			
Economic	1	14	25	60
Technical	4	9	20	60
	Intake based on school year			
10th	5	7	22	58
11th	-	16	23	62

Table 6: Frequency of fruit in student's menus.

It is not advisable to develop a national program for 15% of the pupil population. By gender, the differences are statistically insignificant ($p>0.05$, $f=3$, $\chi^2=1.525$) and we find the same when looking at school years ($p>0.05$, $f=3$, $\chi^2=3.234$).

The result is surprising for the 5.43% of young people choose "zero", 7.60% of the 10th grade students choose the "1 time" option and 15.84% of 11th grade students who choose the same option. The calculated differences are statistically significant ($p<0.05$, $f=3$, $\chi^2=8.202$) and show the need for in-depth studies, as different eating habits may occur in certain groups of students.

Bread offers a high caloric intake, so it is sometimes completely removed from the menu by young people who go on weight loss diets. In the studied group, dominant intake is 4-7 times (70.64%) followed by 2-3 times (17.09%) per week. Differences calculated by sex are statistically significant ($p<0.05$, $f=3$, $\chi^2=10,657$) and show girls' tendency to control their body weight by drastically reducing their intake (Table 7).

Weekly intake	Zero	1 time	2-3 times	4-7 times
	Weekly bread intake based on gender			
Masculine	4	3	9	58
Feminine	1	16	24	78
Total	5	19	33	136
%	2.59	9.84	17.09	70.46
	Bread intake based on high school			
Economic	1	11	14	74
Technical	4	8	19	62
	Bread intake based on school year			
A X a	2	11	18	61
A XI a	3	8	15	75

Table 7: Bread intake in the studied group.

The results obtained by high schools reveal statistically insignificant differences ($p>0.05$, $f=3$, $\chi^2=3.877$) and show similar eating habits for the students. Differences calculated by school years are statistically insignificant ($p>0.05$, $f=3$, $\chi^2=1.952$) and highlight the anchoring in traditions of the students' families.

Discussions

In addressing issues related to growth and development, we need to start from the five general principles of growth: the growth rate decreases with age, being higher in the early years of life; the growth rate is uneven, slow growth periods alternating with faster growth periods (with puberty's specific growth spurts); the growth rate of each tissue/organ is different for the same period of time; the evolution of each tissue/organ is dependent on that of other tissues/organs; different evolution for each gender.

Particular attention should be paid to the principle of different growth rates for different tissues and organs for the same period of time, as the increase in length (height) alternates with the increase in thickness (weight). In this context the student will be tall and slender for a certain period of time after which he/she will become a bit more rotund for another period of time. Thusly, we cannot make a diagnosis of obesity after only one examination because we might be dealing with normal physiological growth [1].

Height values are genetically determined, so it is important to know the characteristics of the population. In an international study that takes into account the average values of height in 15-year-olds from different countries and across continents, one can highlight the existence of large and even very large differences. For males, between 1980 and 1989 the average values reached 168.2 cm in Denmark, 173.2 cm in the Netherlands, 167.6 cm in Romania, 166.0 cm in Japan and 153.0 cm in India. In the female sex the evolution is different, with average values reaching 163.1 cm in Denmark, 166.4 cm in the Netherlands, 160.8 cm in Romania, 156.0 cm in Japan and 148.5 cm in India [10].

In a comparative study carried out on adolescents in Vojvodina and Belarus, the presence of different average values in both sexes was found. In 14-year-old males, average values of young people in Vojvodina reached 167.20 cm and those in Belarus reached 163.09 cm. For females the average values were 162.49 cm and 160.92 cm respectively. For young men, the differences are 4.11 cm and for young women they are 2.68 cm [11]. These are differences specific to a particular population that need to be studied and carefully monitored.

In the studied group, results for height are dominated by average values, a result also obtained on a group of adolescents from the city of Iasi, where in 60.9% of the cases height was at an average level [12]. Average body weight values are also different from one country to another. For 15 year olds, the values fluctuate

from 55.1 kg in Denmark to 57.1 kg in the Netherlands, 54.8 kg in Romania, 56.0 kg in Japan and 38.0 kg in India. For women, the differences are 53.2 kg in Denmark, 57.5 kg in the Netherlands, 52.1 kg in Romania, 51.0 kg in Japan and 37.8 kg in India [10].

In the comparative study carried out on adolescents from Vojvodina and Belarus at the age of 14, one can notice the difference that highlights the characteristics of the population. For young men, average values are 58.43 kg in Vojvodina and 51.85 kg in Belarus [11]. For young women the values are 55.69 kg in Vojvodina and 50.67 kg in Belarus. In the studied group, weight values are generally average for Suceava, the same as in 68.4% of the young people examined in Iasi.

The diagnosis of physical development allows for the correlation between height and body weight. In this study there are 18.65% of young people with disharmonious development with decreased weight and 22.27% with disharmonious development with increased weight. In the previous study carried out on adolescents in Iasi, we observed the presence of 24.8% young people with decreased weight and 15.0% with increased weight. In a study carried out in 2010/2011 young people in Novi Sad show the presence of 8.60% of cases with decreased weight and 13.44% of cases with increased weight out of which 2.15% were obese, [13]. In a Macau adolescent study, there were 19.62% cases of young people with decreased weight and 22.12% of young people with increased weight out of which 10.20% of cases with obesity [14].

In all the studies presented we have pupils with increased weight but also with decreased weight. Medical literature focuses excessively on teens with disharmonious development with increased weight (or with obesity) almost entirely neglecting those with decreased weight (or with malnutrition), a situation that is difficult to understand. Malnutrition can occur due to identification with the current beauty ideal represented by the very slim person.

The changing trends in the past few decades concerning a person's silhouette requires an assessment of how young people perceive their own body weight. The change in body appearance is major during puberty but the way it is perceived depends on each young person and the environment in which they live [8].

Adolescents often try to identify with certain role models, which in female sex are usually the "90-60-90" size (the magazine supermodel), and in male sex there is the image of the tall man with well-developed muscles (the V-shaped body). The physical aspect of teenagers is balanced but this does not correspond with the images portrayed in media, so they become dissatisfied with their own body appearance [15].

Discontent related to body appearance will often be associated with chaotic weight loss diets. Psychological problems such as symptoms of depression or low self-esteem may also occur. The situation can be exacerbated by risk factors associated with the family environment represented by the mother who permanently goes on weight loss diets and risk factors associated with society, usually represented by the unsupportive group of friends [16].

In a study on adolescents in Bucharest, there are 36.93% of girls who have a normal body weight and are unhappy with their body appearance [17]. Our study shows 20.20% of young people who consider themselves too fat and 12.43% who consider themselves too thin. Also, there are 40.93% of students who have an erroneous assessment of their own body weight, which should be in the attention of specialists in the field.

Young people consider food restriction the best method for controlling body weight. In the studied group, the dominant fruit intake is 4-7 times a week (62.17%), as they offer a reduced caloric value. Unfortunately, fruits are poor in proteins and lipids (except oil) so that excessive consumption can be associated with the risk of nutritional deficiencies [18]. Our attention is drawn by the 37.82% of students who eat fruit less than three times per week. For teens in Alexandria, fruit consumption less than three times per week is present in 42.5% of cases [19]. A proper intervention is needed to achieve a balanced diet among adolescents, which will remove the risk of malnutrition or obesity [20].

Weight loss diets frequently imply the removal of bread from the menu, a result also seen in our study, where there are statistically significant differences in the consumption of bread between girls and boys. Bread is completely absent from the menu in 2.59% of cases or is only consumed once a week in 9.84% of cases.

The male sex shows 5.40% of young people who chose the "zero" option and 4.05% who chose the "1 time" option. In young women there are 0.84% of "zero" answers and 13.44% of "1 time" per week answers. In the study carried out in Alexandria, 23.3% of young people consume bread once a day or less [19]. The situation is serious for the young people in our study who use drastic reduction or complete removal of bread from menus. Bread is rich in plant proteins and carbohydrates, providing an elevated caloric intake. Removal from the menu can be associated with the appearance of serious protein imbalances.

Conclusions

The height and weight of the pupils are mainly placed at an average level; the result being considered as positive. The percentage of young people with disharmonious development reaches 40%. This is worrying as we are talking about young people whose growth is slowing down, so it is not related to a growth spurt and so not a situation that will pass. Perception of body weight is incorrect in 40% of young people, which is a big problem. There are young people who wrongly consider themselves too fat or too slim, a situation that will result in dissatisfaction with their own body appearance.

Students in the studied group consume many fruits; a positive element that makes unnecessary the initiation of targeted educational programs in which they are encouraged to eat more fruit. Girls eat less bread because it fattens.

These studies are very important because they reveal knowledge of the real state of the issue in each country and guide specialized intervention according to needs and not according an overgeneralized idea.

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