Original Paper

The Evolution of Anthropometric and Physiometric Parameters, and of Anthropometric Indices Based on Age and Gender in a Group Of Pupils

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ABSTRACT: For the human body as a whole, the pace of physical development decreases with age, this very decrease not being uniform. For both sexes, the development is genetically determined, the girls having a much earlier osseous development in all development stages, whereas boys always present a bigger height and weight than girls, except the prepubertal stage. A mixed-gender group of pupils, with ages ranging from 11 to 18 years, was assesed through anthropometric measurements, for which some anthropometric and physiometric parameters were measured, and also some anthropometric indices of the skull and trunk. Analysing the obtained data, we found out that there are no major differences between the two genders, except the predictable ones, but, regarding the middle school and high school pupils, the former have smaller dimensions.

KEYWORDS: *antrhopometry, physiometry, pupils*

Introduction

One of the main factors that has a major role in the complex development process of each individual is the social environment. The social environment influences the somatic development, the thinking process, and affectivity, but it also represents the very setting in which the individual's life and the community's life run, the psychological and social balance, and the performance of an individual depend on the interrelations with the environment.

In order to analyse the interrelations between various factors with effects on the pshysical and neuropsychologic development of children, numerous researches were performed/carried out. It was discovered that some medical conditions in childhood, as well as subnutrition have negative effects on motor development [1;2]. Many studies concerning the relations between weight, height, body mass index in relation to age and motor skills, showed that motor development and height are usually independent [3;4;5].

Material and methods

A mixed-gender group of pupils was assessed through anthropometric measurements, with ages raging from 11 to 18 [6;7].

Based on these measurements, the following anthropometric parameters and indices were calculated [8:9;10;11]:

- maximum cranial length (anteroposterior diameter) (G – OP);
- maximum cranial breadth (transverse diameter) (Eu – Eu);
- minimum frontal breadth (FT – FT);
- cranium vault height (neurocranial height) (T – V);
- upper facial height (viscerocranium height) (N – GN);
- nasal height (N – SN);
- upper facial breadth (viscerovranium breadth) (Zy – Zy);
- minimum facial breadth (mandible breadth) (Go – Go);
- nasal breadth (AL – AL);
- cranial perimeter (PC);
- body height (T);
- body weight (G);
- thoracic perimeter (TP).
- cephalic/cranial index (IC) ; Eu-Eu / GOP
- vertico-longitudinal (IVL) ;T-V/GOP
- vertico-transversal index (IVN) ;T-V / Eu-Eu
- facial index (IF) ;NGN / Zy-Zy
- nasal index (IN) ; AL-AL / NSN
- body mass index (IMC) weight(kg) /height(m)

Results

IC (cranial index) has some random variations due to the subgroups special content, but it is mostly horizontal, with an insignificant increase for females . (Fig.1).

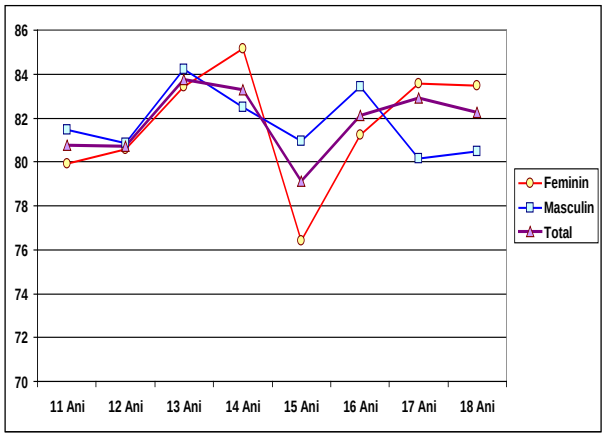

Fig.1.The evolution IC based on age and gender

The facial index (IF) decreases at the age of17 – 18 due to the difference of the subgroups (Fig. 2). Randomly, within the last 2 years, the majority of the pupils/ study subjects have had a smaller facil index. As the increase is not signficant, but only a random decrease is present, we cannot say that this index does not modify.

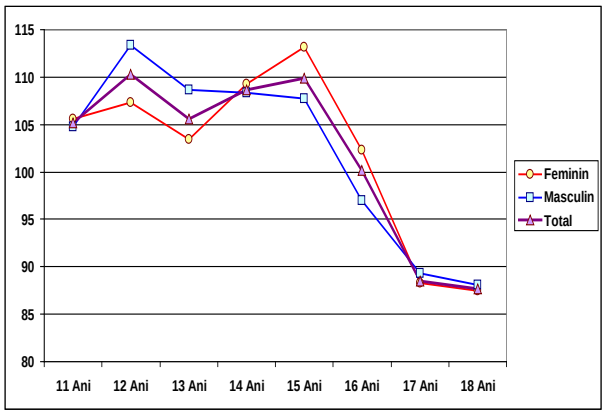

Fig.2.The evolution IF based on age and gender

IN nasal index (Fig. 3) increases starting with 15, 16 years of age, thus showing that the nose length increases more than its breadth, becoming sharper. This fact is well-known both in medicine and in any family ceea ce indică faptul că în ultimii ani, the person approaching adult age has a significant increase of the nasal length than of nasal breadth.

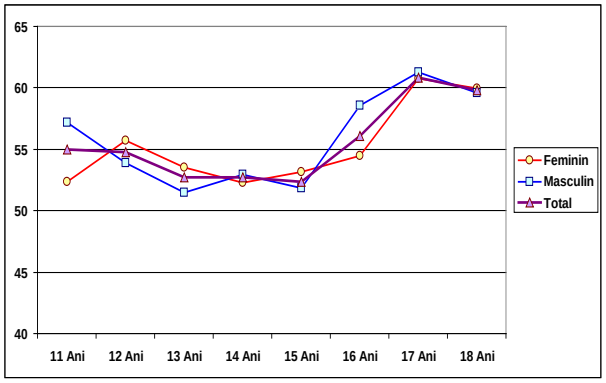

Fig.3.The evolution IN based on age and gender

The IVL (vertico-longitudinal index) (Fig. 4) slightly increases by the age of 15, and the vertico-transverse index IVT (Fig. 5) increases even more, few percentage more than IVL, and it starts earlier at the age of 14..

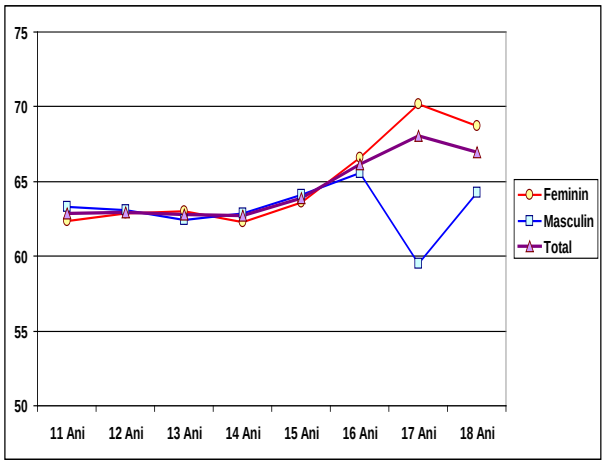

Fig.4.The evolution IVL based on age and gender

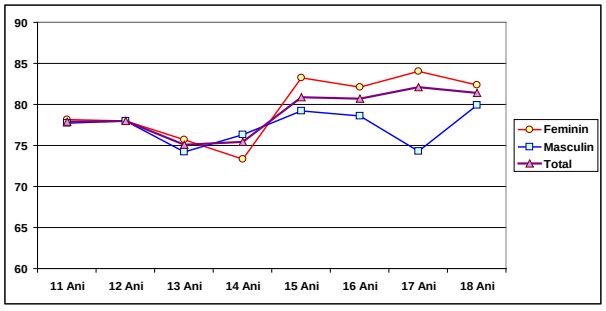

Fig.5.The evolution IVT based on age and gender

Body mass index (IMC) ((Fig. 6) increases on average with 25 % for both sexes, gradually, and lineary with age.

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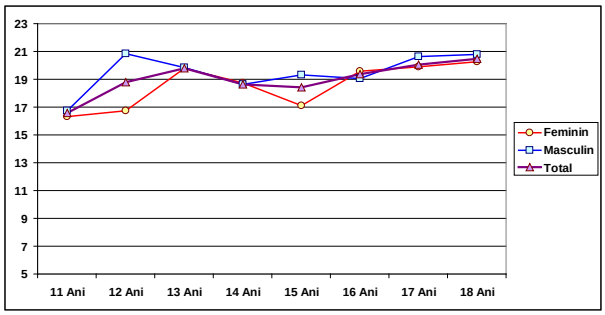

Fig.6.The evolution IMC based on age and gender

The cranial length/ antero-posterior cranial diameter(GOP) evolves almost horizontally, and for females it decreases in the last 3 years, while for males there is an obvious increase (Fig. 7).

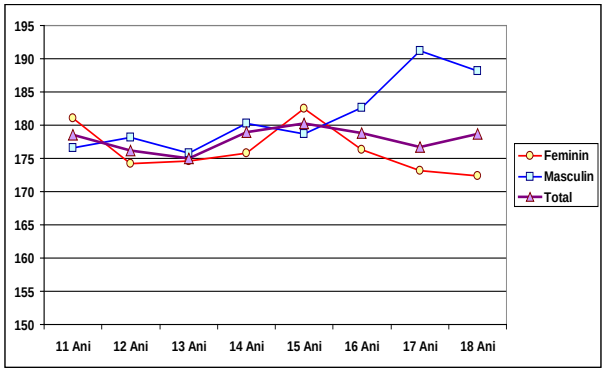

Fig.7.The evolution GOP based on age and gender

On average, the line stays mostly horizontal. Thus, this parameter (GOP) does not increase beyond the age of 11.

The maximum cranial breadth (transverse diameter) (EU – EU) has a slight tendency of increase mainly in males (Fig. 8). The average value per years, irrespective of gender, is the age of 18, almost identical to the one at the age of 11, although this parameter also stays almost unchanged.

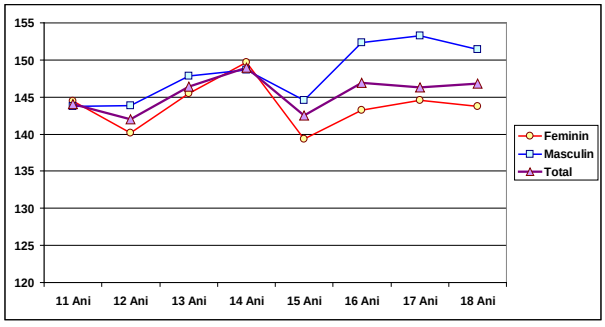

Fig.8.The evolution EU-EU based on age and gender

The minimum frontal breath (FT-FT) has a significant increase for both sexes and for the average value per years. If at the beginning, at the age of 11-12, the girls have a wider forehead (102,22) than boys (92,45), at the age of 18 the values are almost identical between the two sexes, and also much higher. The increase is on a steady ascending line from the age of 11 till 18. (Fig.9).

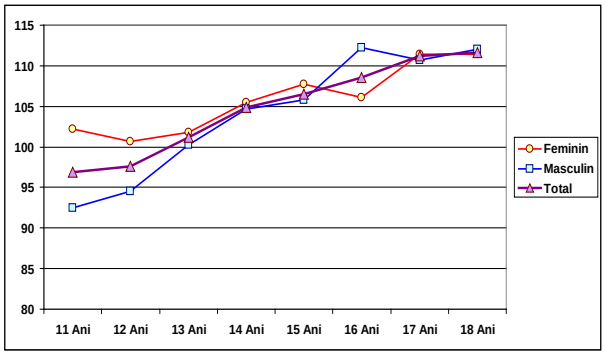

Fig.9.The evolution FT-FT based on age and gender

The left-side cranium vault height (TSV) (Fig. 10) has a slight increase tendency starting with the age of 11, equal for both sexes, and it limits itself at the age of 17.

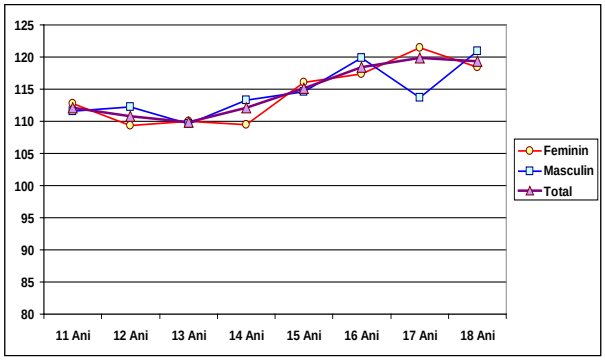

Fig.10.The evolution TSV based on age and gender

The parameter of right-side cranial vault height (TDV) (Fig. 11) evolves in the same manner as the left-side cranial vault height, with an initial increase at the age of 13, and then it limits itself at the age of 17. But there is also a random variation in the boys group, which shows a significant decrease at the age of 17, of less amplitude, being present in the left-side cranial vault too.

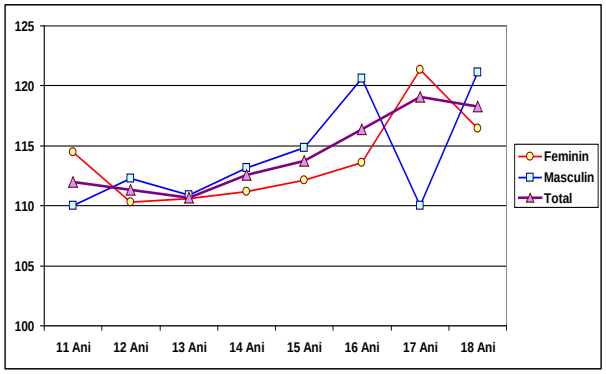

Fig.11.The evolution TDV based on age and gender

Regarding the cranial vault parameters, we can notice a bigger increase tendency for the transverse parameters(EU-EU), than for the longitudinal parameters, and also an obvious increase of the frontal breadth and cranial vault height.

Zy-Zy – the upper facial breadth up to the age of 15 evolves mainly on a horizontal line, identical for both sexes, then there is a very important/significant increase identical for both sexes at the age of 16-17, which limits itself at 18. (Fig. 12).

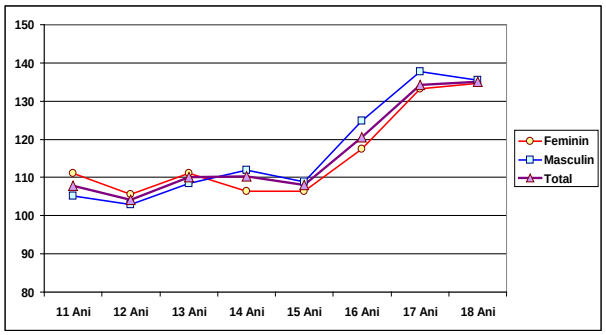

Fig.12.The evolution ZY-ZY based on age and gender

The PC (the cranial perimeter) has a very little tendecy of increase up to the age of 15. At the beginning, the girls have a slightly bigger perimeter, then boys slightly predominate (Fig. 13).

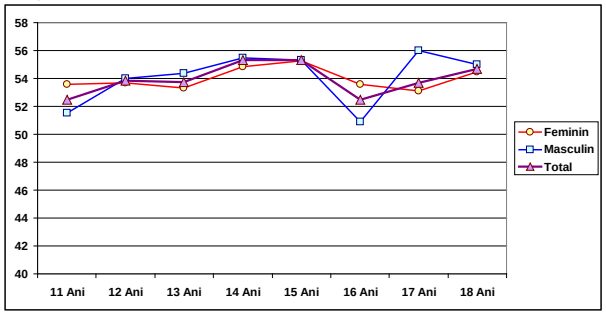

Fig.13.The evolution PC based on age and gender

The PT (thoracic perimeter) has a slight increase due to aging especially in boys within the last 2-3 years (Fig. 14) .

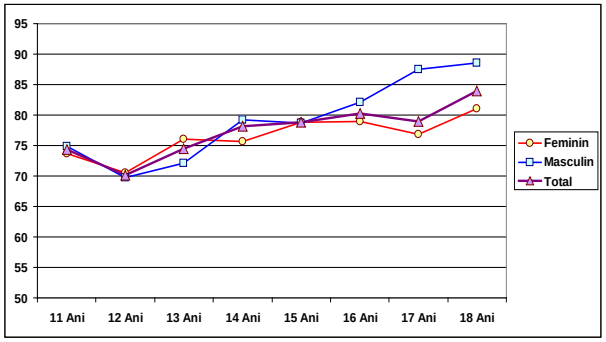

Fig.14.The evolution PT based on age and gender

The total body weight (G) , as predictable , increases with 20 kilograms for girls, and 23 kilograms for boys, during the 8 years, boys having a much bigger weight than girls at the age of 18, approximately 11 kkilograms more (Fig. 15).

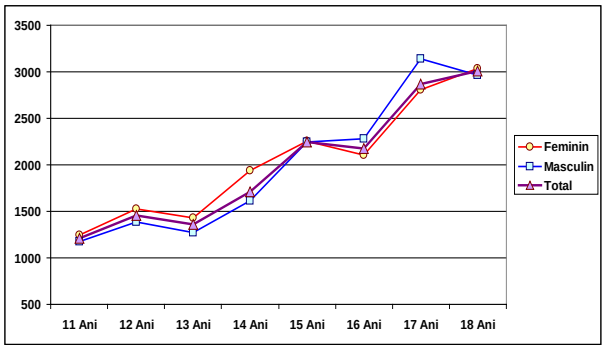

Fig.15.The evolution G based on age and gender

The height (T) (Fig. 16), just like weight, has an important predictable increase. The increase is of 20 cm for girls, and 38 cm for boys. If the girls were taller with 5 cm at the age of 11, at the age of 18 ani the boys are 13 cm taller than girls.

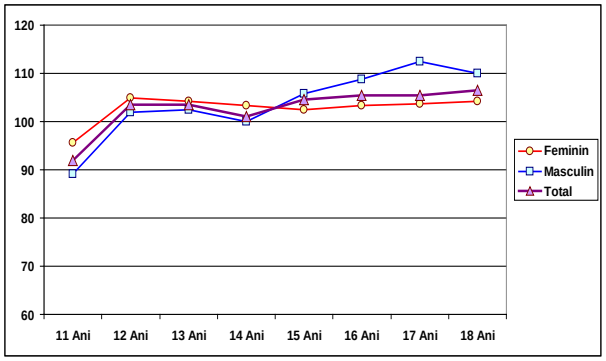

Fig.16.The evolution T based on age and gender

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The higher values of height. weight, and cranial perimeter for girls at ages younger then 11-12 could be explained by an earlier growing up and puberty than in boys, afterwards boys surpass girls.

The PT (tohracic perimeter) has a slight increase due to age, especially for boys within the last 2-3 years. (Fig. 17).

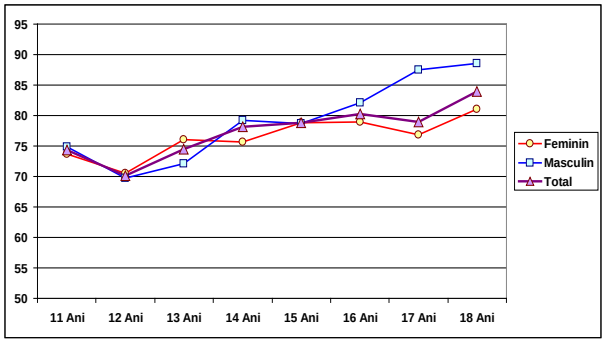

Fig.17.The evolution PT based on age and gender

The CV(vital capacity) (Fig. 18) shows the most impressive increase, surpassing at the age of 18 the double of the value it has at 11. Thus, girls have an increase from 1242,22 to 3037,5 , and boys from 1178,78 to 2968,75. At the age of 11 and of 18, the girls slightly surpass boys' values, the same happening at the ages of 12,13, and 14. At 16 and 17, boys surpass girls, but at the age of 18 girls are again ahead of boys.

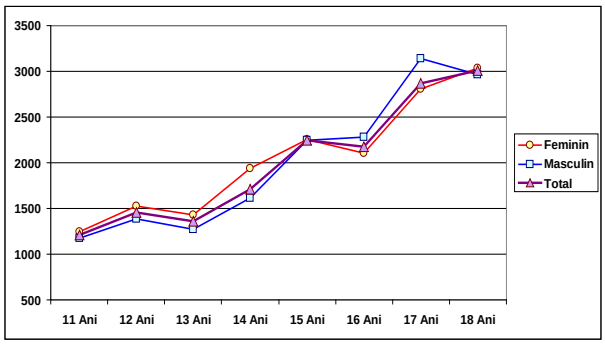

Fig.18.The evolution CV based on age and gender

Systolic arterial pressure - TAS(Fig. 19) shows an increase in value, especially after the age of 11 and 12 for both sexes, from 95,56 to 105 in girls, and from 89,09 to 102 in boys. Afterwards, there is no increase in girls up to the age of 18, and for boys starting with the age of 15 till 18 there is some increase in value (from 102,5 to 110).

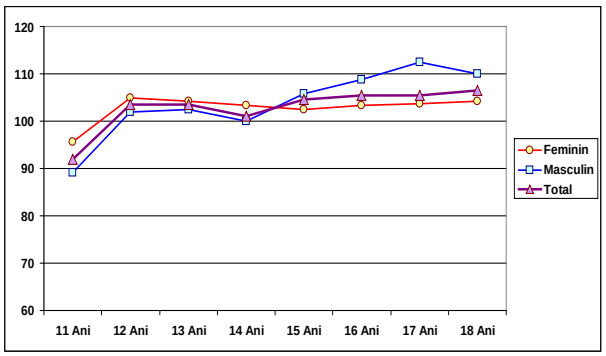

Fig.19.The evolution TAS based on age and gender

Diastolic arterial pressure TAD(Fig. 20), just like systolic pressure – TAS , has an important increase in value only at the age of 11 and 12, for both sexes. Afterwards, it remains strctly unchanged, even if for males it showed two small random angulary of increase.

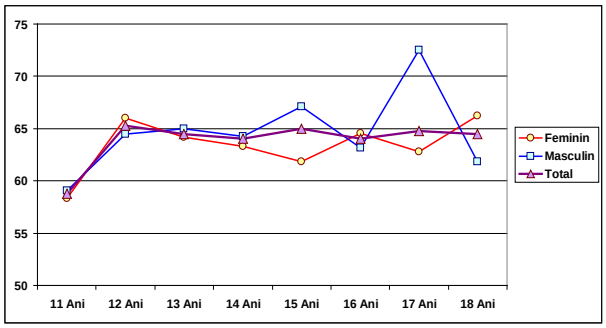

Fig.20.The evolution TAD based on age and gender

The pulse (P)(Fig. 21) increases between the ages of 11 and 12, then the increase is slower up to 18, and it evolves in parallel with systolic arterial pressure and diastolic arterial pressure.

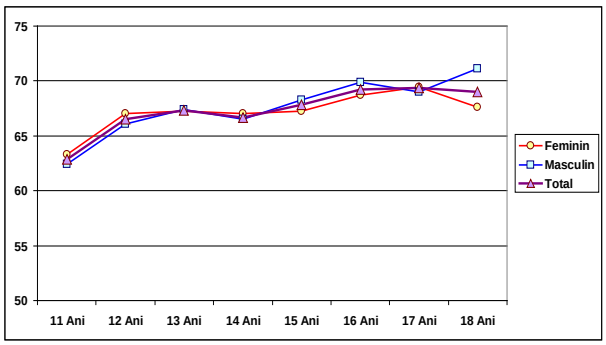

Fig 21.The evolution P based on age and gender

Discussions. Conclusions.

-Anthropometric parameters have an obvious increase tendency, mainly the cranial vault height and facial breadth. The longitudinal parameters do not increase.

-Physiometric parameters have high vales for the vital capacity, and also for systolic arterial pressure and diastolic arterial pressure, with a lap for systolic and diastolic pressures, mainly between the ages of 11 and 12. The pulse acts just like the pressures between the ages of 11 and 12, but it increases only by 2%.

-Transverse indices increases more than the longitudinal ones.

-There are no major differences between the sexes, except the predictable ones regarding height, weight, cranial perimeter, and thoracic perimeter.

-Betweeen middle school and high school pupils, the former have all sizes smaller. Do the last generations have smaller sizes ?

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