STUDY OF BODY COMPOSITION WITH A RISK DIAGNOSIS ASSOCIATED WITH OBESITY

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INTRODUCTION

The main structural components of the human body are muscle, bone and fat, but there are also other tissues called residual mass. Therefore, in order to know in detail the body composition of the human body, the total weight must be divided into these components.

It must be taken into account that there are differences between the sexes in the proportion of these components and that the weight and height tables are not useful for determining said composition.

This study is important to understand the effect of different factors (diet, growth, physical activity, diseases) on the organism. Theoretical models indicate that a person of about 70 kg has a proportion of 10 % fat weight, 15 % bone weight, 45 % muscle weight and the rest is residual weight.

MATERIAL AND METHODS
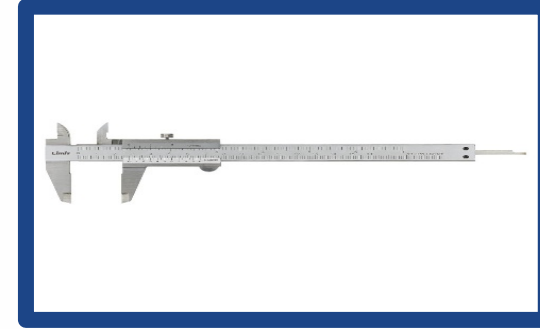
Caliper to measure bone mass based on the biepicondylar diameter of the femur and the bistyloid diameter of the wrists.

With the picometer, the accumulated fat in the skin folds is estimated, the folds that were used were the triceps or tricipital, subscapular, supraliac and abdominal.

We measure the weight as it is needed to observe the residual mass, muscle and fat mass. Also for BMI, so height had to be measured.

The tape measure is used to take the BMI data.

OBJECTIVES

The aim of this research is to observe through a series of data whether there is an increase in obesity from infancy to adolescence. This research is essential to assess the nutritional status, to monitor patients with acute or chronic malnutrition, patients with acute or chronic malnutrition and to diagnose the risk associated with obesity.
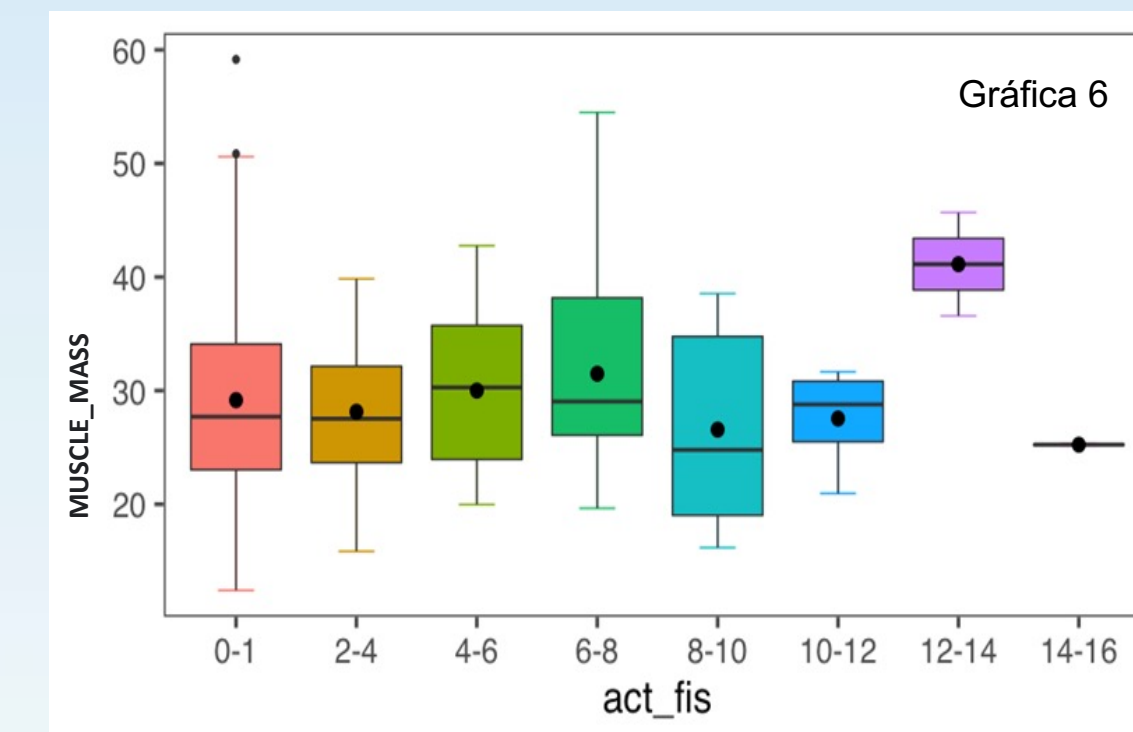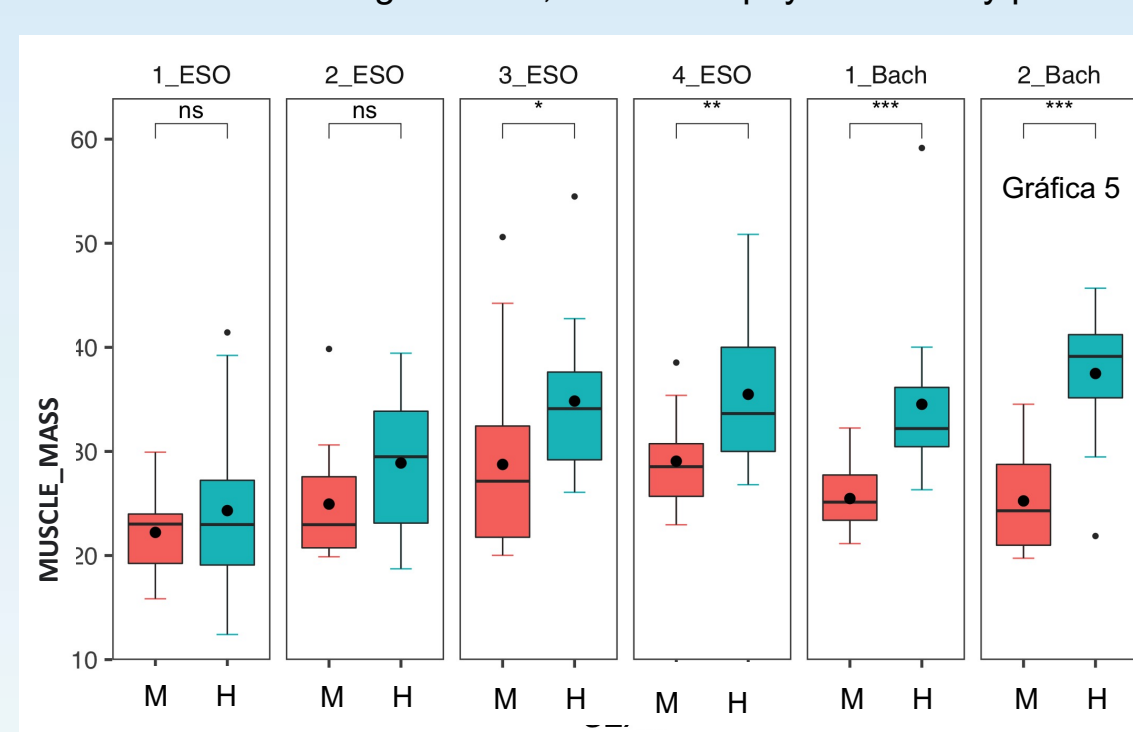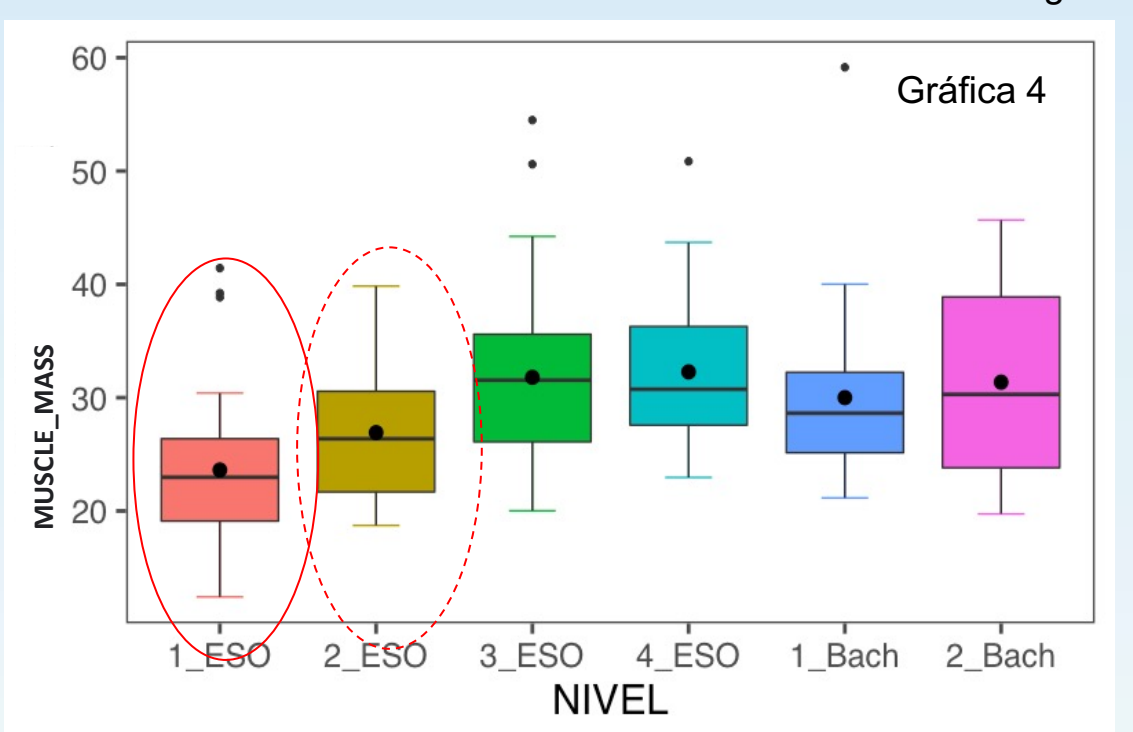
RESULTS

Niveles	Peso (Kg)	% Peso óseo	% Peso graso	%Peso muscular	% Peso Residual
1º ESO	49,87	16,8	27,2	47,4	22,0
2º ESO	58,84	17,1	24,5	46,0	22,0
3º ESO	66,53	15,4	21,9	46,9	22,6
4º ESO	66,17	15,1	20,5	48,8	22,4
1º Bachillerato	63,47	15,9	22,1	47,3	22,3
2º Bachillerato	65,17	15,3	22,2	47,7	22,3

Table 1: Table: Percentage of bone weight, fat weight and residual weight at each of the center's teaching levels.
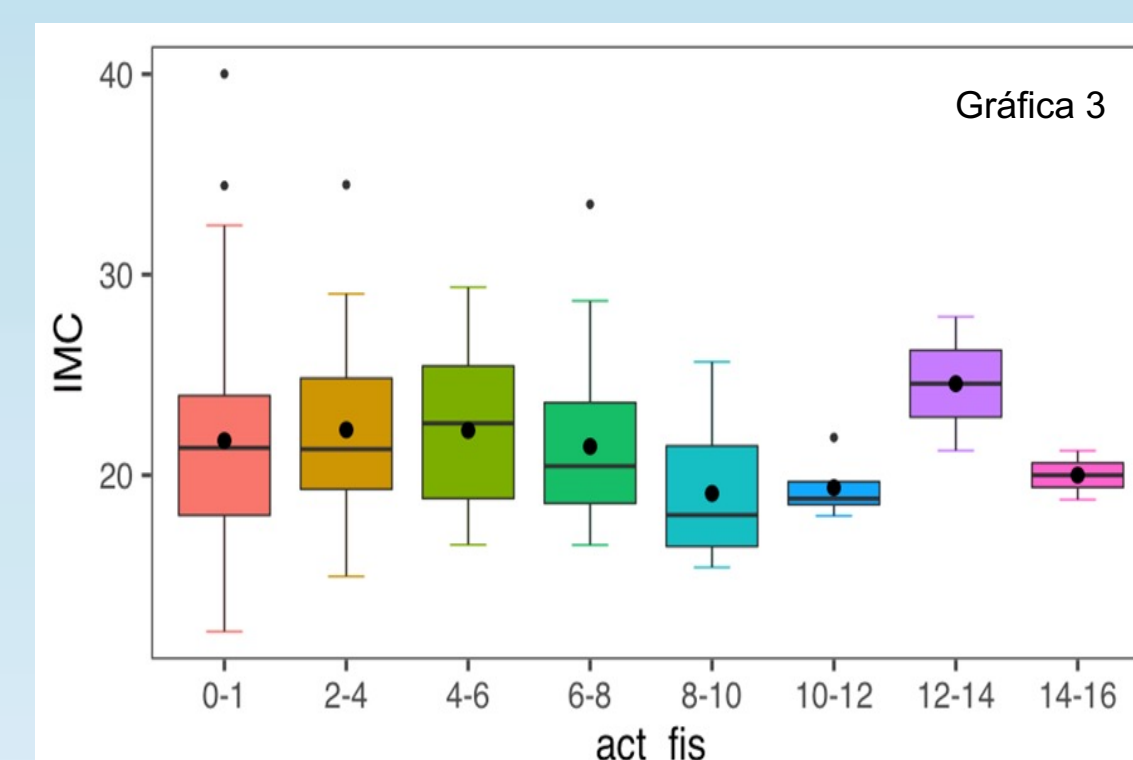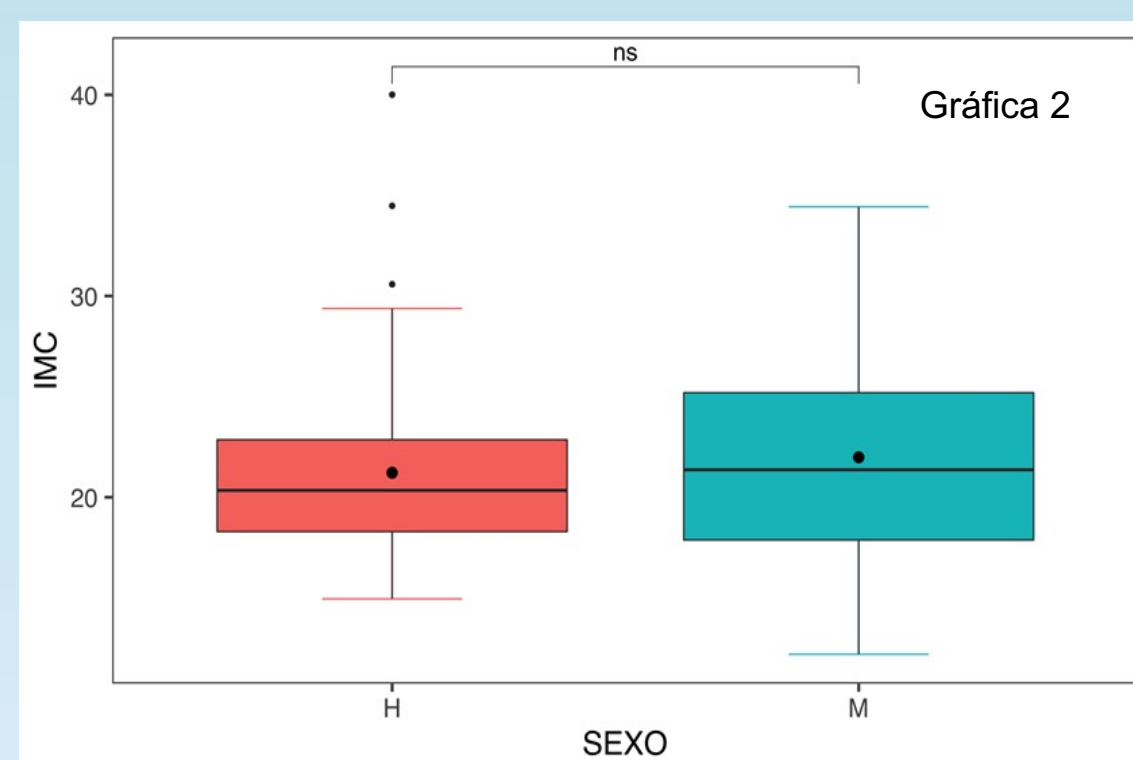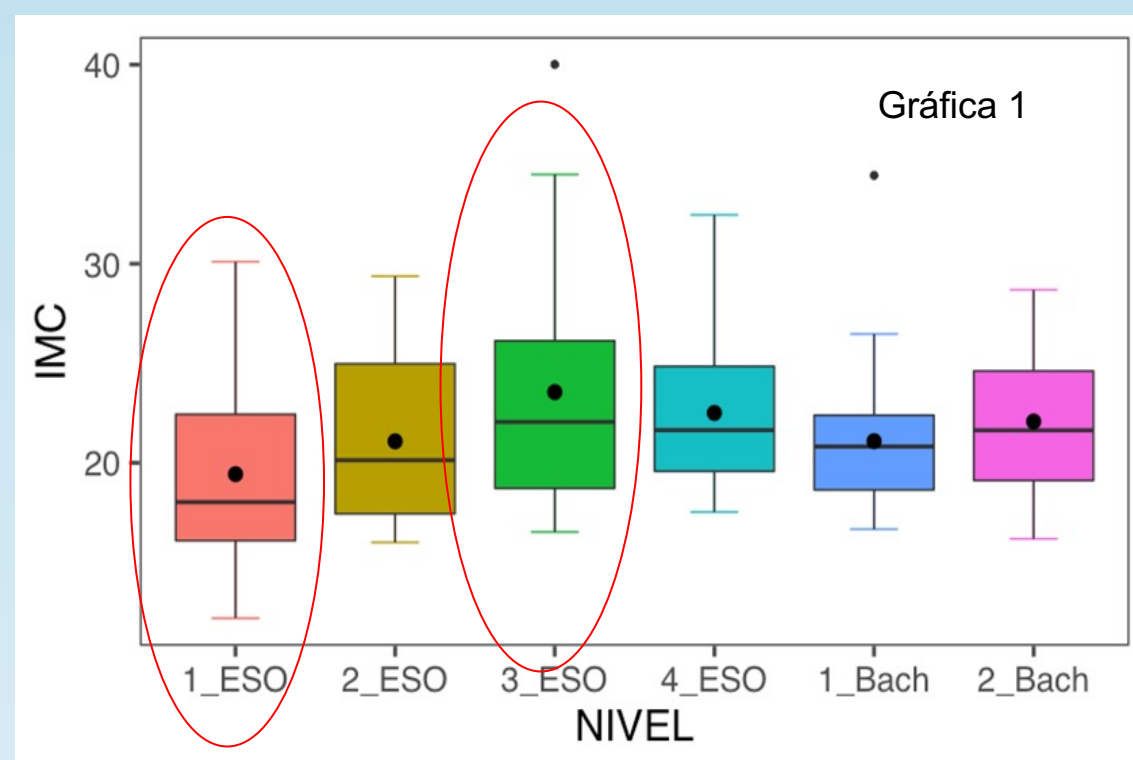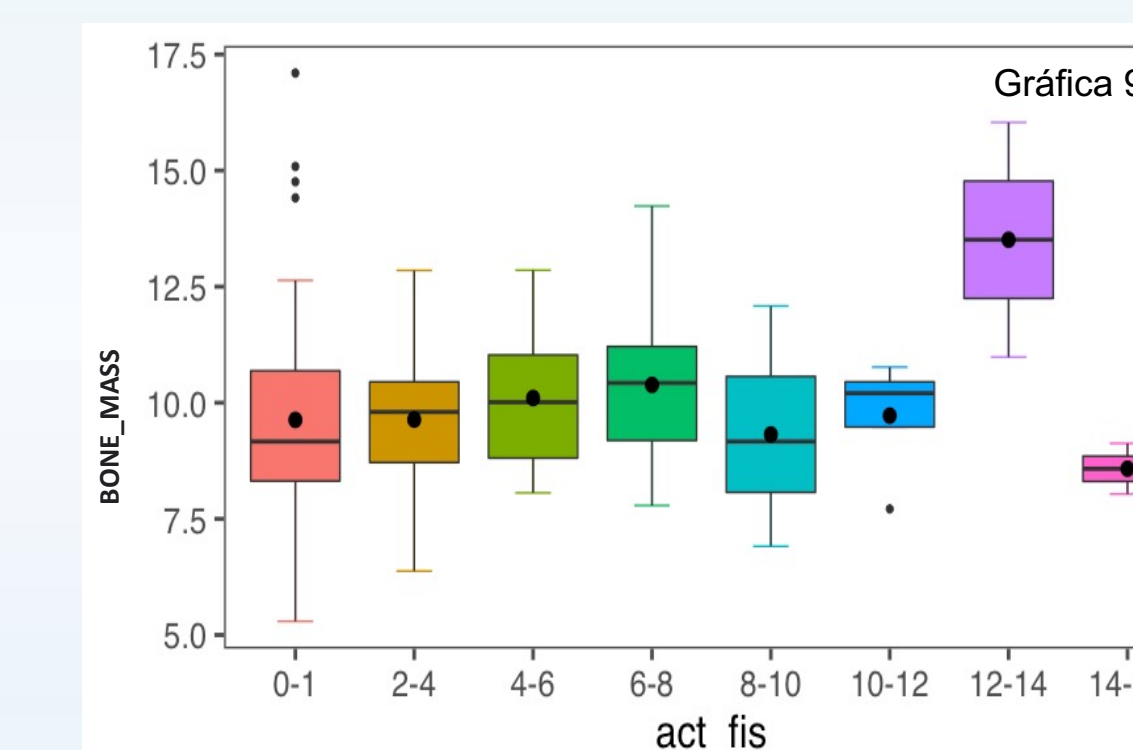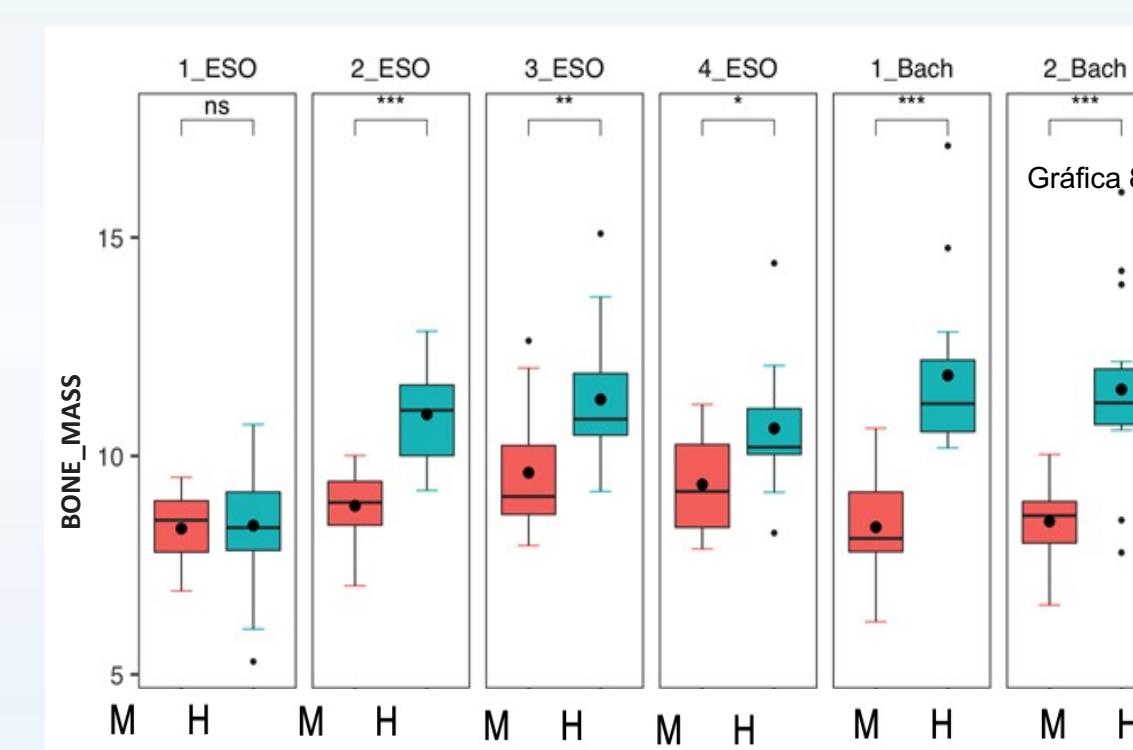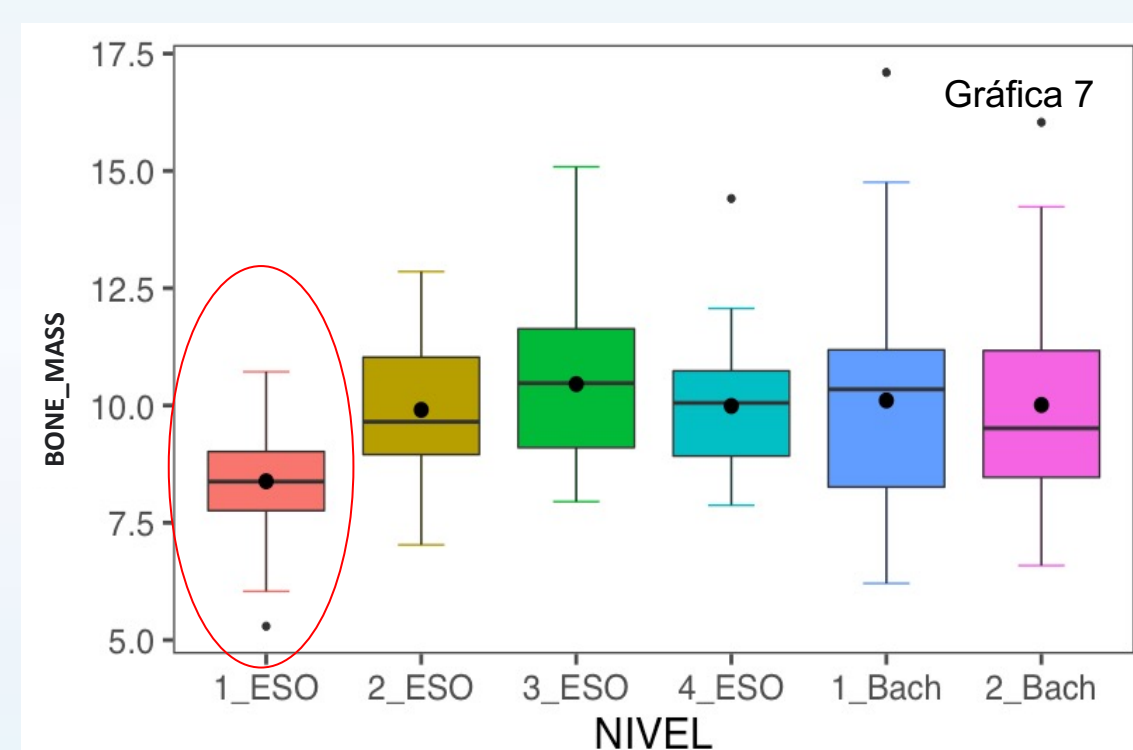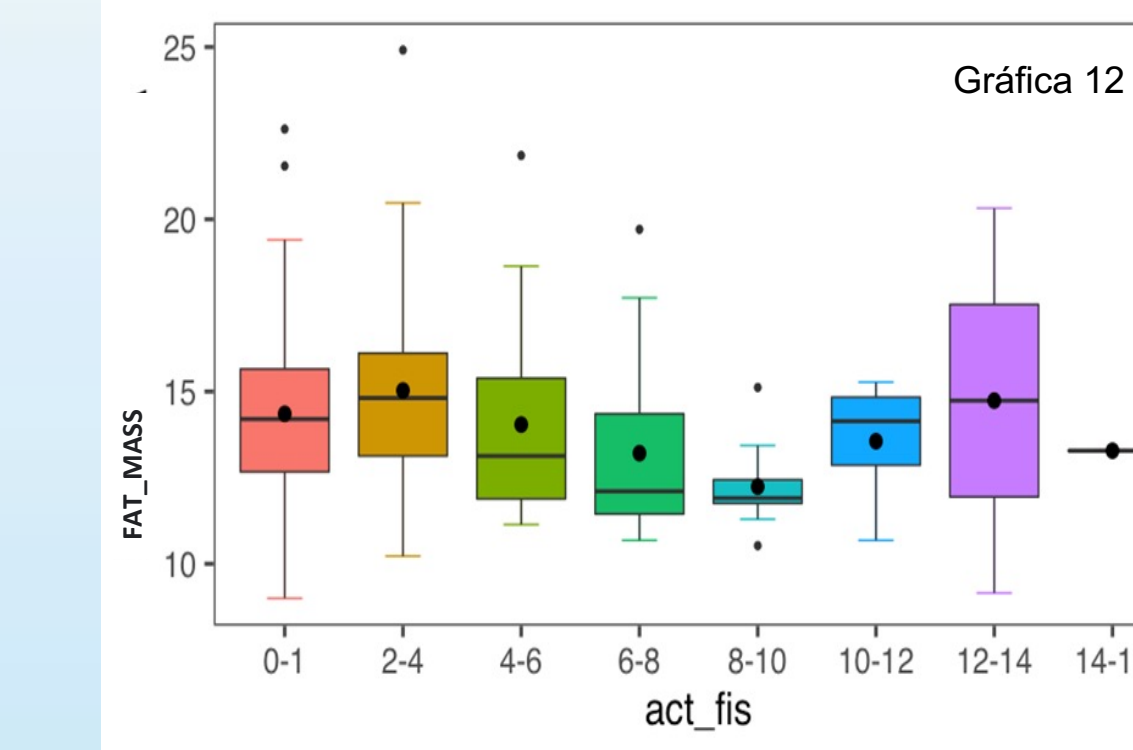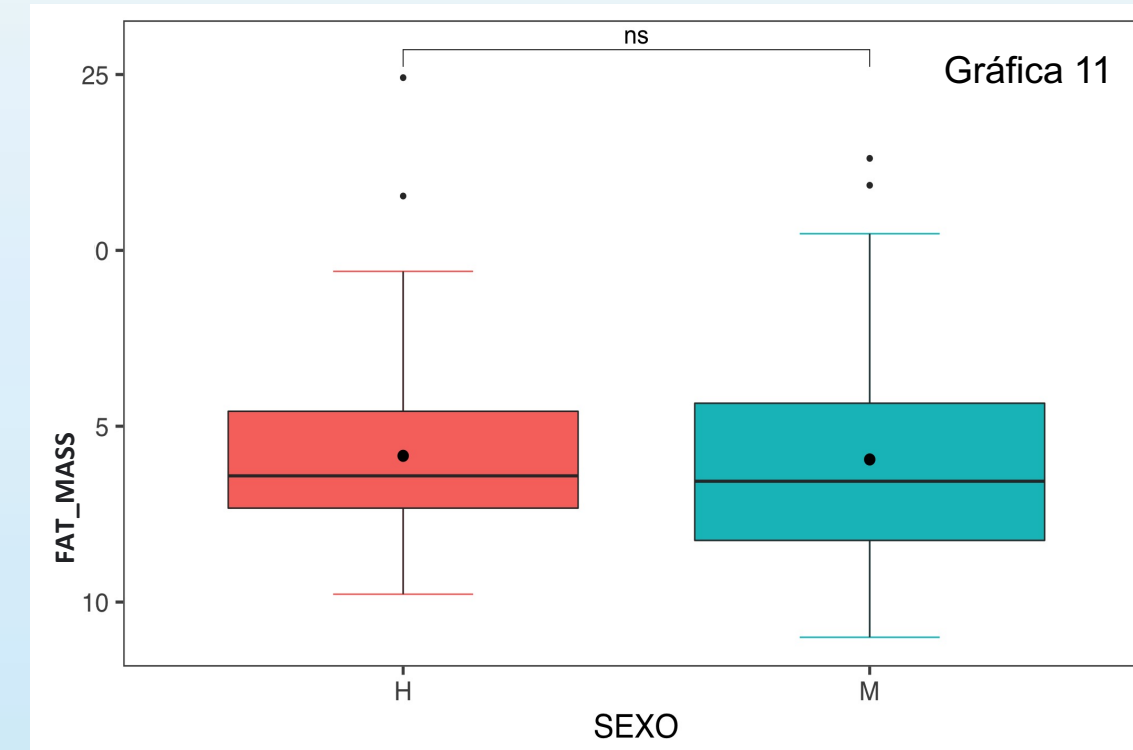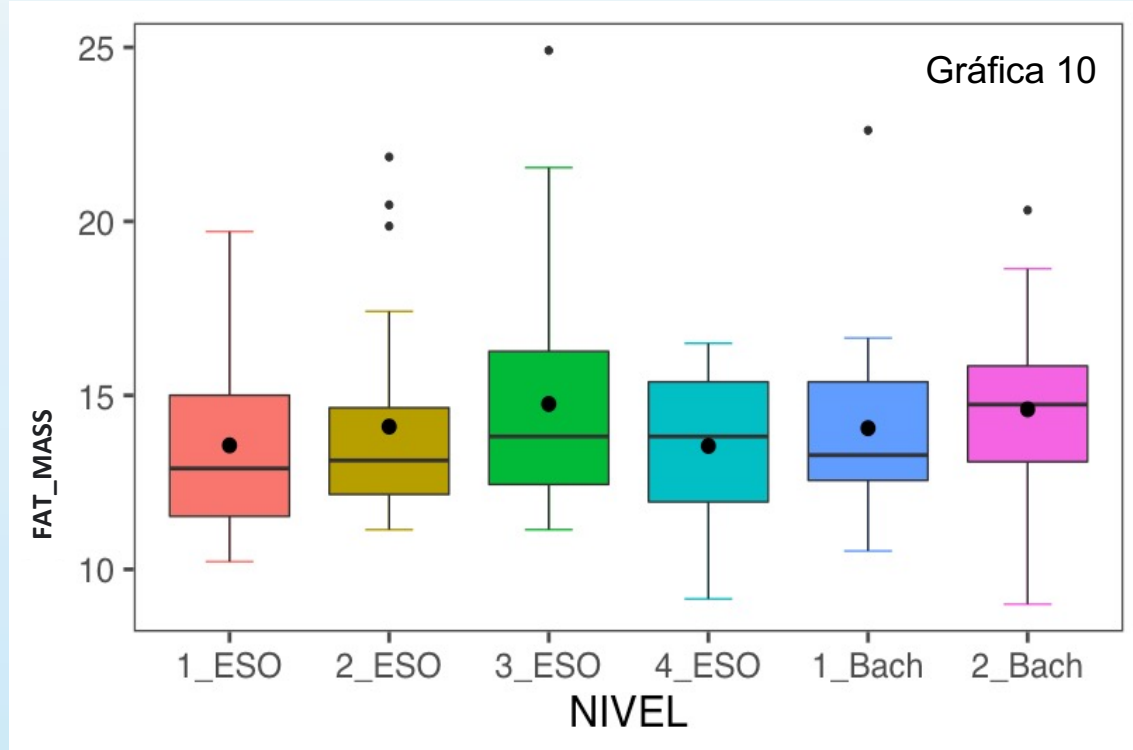

Figures 1, 2 and 3: BMI according to levels, sexes and physical activity performed

IMC		groups
3_ESO	23.5523	a
4_ESO	22.5053	ab
2_Bach	22.0764	ab
1_Bach	21.0888	ab
2_ESO	21.0805	ab
1_ESO	19.4319	b

The 3rd ESO and 1st ESO levels (Graph 1) show a BMI significantly different from the rest of the levels. However, at all levels, the average BMI is within the normal range of 18.6 to 24.9 kg/m2.

The BMI between boys and girls (Figure 2) also shows no significant differences. The number of hours students spend in physical activity does not seem to influence the BMI of students (Figure 3).

Graphs 4, 5 and 6: Muscle mass according to levels, sexes and physical activity performed.

MUSCLE_MASS		groups
4_ESO	32.2745	a
3_ESO	31.7947	a
2_Bach	31.3665	a
1_Bach	30.0033	a
2_ESO	26.9153	ab
1_ESO	23.6179	b

MASA_MUSCULAR		groups
Men	32.1553	a
Women	26.1696	b

Pupils in 1st ESO (Graph 4) have a significantly different muscle mass to the rest of the levels. On the other hand (table 1), it is noteworthy that in 3rd ESO, 4th ESO, 1st Baccalaureate and 2nd Baccalaureate, the percentages of muscle mass with respect to the average weight in kg of the people is above the estimated reference value of 45%, which indicates that these levels present a development of muscle mass above what is expected.

The study of this parameter by sex (Graph 5) shows a progressive increase in the significant differences between boys and girls as we move up the levels. Boys in 2nd Baccalaureate have much more muscle mass than girls. The number of hours spent doing sport does not show a significant effect on muscle mass (Figure 6).

Figures 7, 8 and 9: Bone mass according to levels, sexes and physical activity performed

BONE_MASS		groups
3_ESO	10.45519	a
1_Bach	10.10617	a
2_Bach	10.01067	a
4_ESO	9.98855	a
2_ESO	9.90581	a
1_ESO	8.38373	b

MASA_OSEA		groups
Men	10.64995	a
Women	8.86774	b

Pupils in 1st ESO show a significantly different bone mass from the rest of the levels (Graph 7), which is consistent with the fact that the average weight of this level is low (49.87 kg) and that the % bone weight of this level (16.8 %) is higher than the estimated average reference value of 15 %. In 2nd ESO the % of bone mass is similar to that of 1st ESO.However, the weight of pupils at this age is higher (58.84 kg), which means that this parameter is not significantly different.

It is noteworthy that as we move up the levels, the diference is more remarkable between boys and girls (Graph 8). Thus, in the baccalaureate levels, the average bone mass of boys is much higher than that of girls. Finally, physical activity has no effect (Figure 9).

Figures 11,11 and 12: Fat mass according to levels, sexes and physical activity performed

FAT_MASS.		groups
3_ESO	14.7533	a
2_Bach	14.5983	a
2_ESO	14.1026	a
1_Bach	14.0577	a
1_ESO	13.5635	a
4_ESO	13.5472	a

Fat mass is not different between sexes, nor is it affected by the number of hours that students at IES Fidiana dedicate to exercise (Figures 11 and 12). With regard to the different levels of education, no significant differences are found between them (Figure 10).

However, from table 1 it can be deduced that at all levels this percentage is in the range of 20-25 %, and is therefore much higher than the reference value of 15 %. We can deduce that there is a worrying increase in this and that it may lead to future obesity problems.

Figures 13, 14 and 15: Residual mass according to levels, sexes and physical activity performed.

RESIDUAL_MASS		groups
3_ESO	15.2006	a
4_ESO	14.8304	a
2_Bach	14.6284	a
1_Bach	14.1403	a
2_ESO	13.0423	ab
1_ESO	10.9459	b

In the ages of 12 to 14 years, which corresponds to 1st and 2nd ESO, the residual weight is significantly different from the rest of the levels (Graph 13). On the other hand, from table 1 we can deduce that at all levels there is a percentage of around 22% and this is lower than the theoretical 30%, which may be associated with excess bone weight also found at all levels. Neither physical activity nor sex had a significant influence on the different levels (graphs 14 and 15).

CONCLUSIONS

1.- The hours of physical activity carried out by the students of the IES does not affect neither BMI, nor muscle mass, nor bone mass, nor residual mass.

2.- Men and women present significant differences with respect to the variables bone mass and muscle mass, with boys having more bone mass and more muscle mass than girls. These differences are greater as the age of the students increases.

3.- The average BMI of the students of IES Fidiana is within the normal range of 18.6 to 24.9 Kg/m2. However, the fat mass in all age groups is in the range of 20-25 %, which is much higher than the reference value of 15 %. If the proportion of fatty tissue in the bodies of the new generations continues to increase, a society with obesity problems may develop in the future.

4.- The bone mass of pupils in 1st and 2nd year is consistent with the fact that the average weight of this level is low (49.87 kg) and that the percentage of bone weight at this level (16.8 %) is higher than the estimated average reference value of 15 %.

The residual weight in all levels is below the theoretical reference value of 30 % and the significant difference found in 1st and 2nd Eso can be explained by the higher bone weight and fat weight found in these levels.