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DIFFERENCES IN SOME VARIABLES THAT ESTIMATE OBESITY BETWEEN 12 YEAR OLDS FROM THE CITY AND THE SUBURBS

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(Original scientific paper)

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Abstract

This research was conducted on a population of 93 male, 11 years old, sixth grade, in two elementary schools from Skopje: "11 Oktomvri"(downtown) and "Aco Shopov"(in Radishani, suburb). The purpose was to determine the differences in some variables that estimate obesity between pupils that live in the city center and in the suburb. 8 variables were measured: body mass (BM), height (BH), body mass index (BMI), height (PBH) and body mass index (BMI), percentage of fat tissue (Fat%), abdominal (abdsf), back (backsf) and upper arm (uparmsf) skin folds and an index for estimating obesity as a sum of body mass index and three skin fold thicknesses (BMI+sum). Besides the expectations that differences will appear due to the settlement in which pupils live, yet such differences are not present among male pupils. This might be due to several reasons, perhaps physical inactivity among the pupils who live in both settlements, inappropriate nutrition, and maybe because we have pupils who live and go to school in the city center, and pupils who only study in such schools, but live in the suburbs.

Key words: *12 year old pupils, male, female, obesity, center, suburb*

Introduction

Today obesity is considered as one of the most widespread diseases in the world with 1.3 billion subjects. Some authors, like Kelly T., Yang W., Chen C.S., Reynolds K.& He J. (2008) expect that until 2025 3.3 billion people in the world may be overweight or obese. There are close connections between obesity and some illnesses like: hypertension, diabetes, gallstones, skeleton deformities and some illnesses that are life-threatening like: heart attack and stroke. But, only some people may be aware that as a side effect of the modern technology, even more widespread occurrence is sedentary lifestyle of children, young people, teenagers and older people. Maybe that is the reason nowadays children play less and less in the yard and on the streets. Unfortunately, this phenomenon can be seen not only in the big cities, but also in the countryside. Due to a decreasing physical activity early in life, "rejuvenation" of some illnesses can be expected, that usually used to appear only among older people in the past, like hypertension (due to obesity and sedentary lifestyle) and skeleton deformities (spondylosis, kyphosis) that are connected to improper sitting, bad position of the head, sedentary lifestyle.

Method of Work

Subjects

This research as part of another extensive research, was implemented on a population of 93 sixth grade male pupils, 11 years old, divided into two subsamples, according to the school they study in "11 Oktomvri"(center) and "Aco Shopov"(in Radishani, a suburb). 8 variables, through which body composition and obesity can be determined, were measured: body mass (BM), height (BH), body mass index (BMI), percentage of fat tissue (Fat%), abdominal (abdsf), back (backsf) and upper arm skin folds (upperarmsf) and a variable - BMI+ sum, which is calculated as a sum of BMI index with three skin folds, and it estimates obesity.

The variables for estimating the body composition were measured with Tanita TBF-400, and skin folds were measured with a caliper.

Statistical analysis

In order to estimate the differences between groups of pupils in every subsample, descriptive statistics was applied after which an univariate analysis of variance – ANOVA was applied . The results are shown in four tables.

Purpose of the research

The purpose of the research was to see if any differences in the variables that estimate obesity existed between male pupils from the city center and suburbs.

Results and Discussion

The results in the research are showen in four tables. In table 1 the results of the statistical analysis of male pupils from center (N=34) are shown with the followin varibales: minimum, maximum, mean, standard deviation, skewness and kurtosis. According to the results of the skewness it can be concluded that in 7 out of 8 variables the distribution is simetric, since their values are less than 1. Only in one variable, backsf (back skin folds), the distribution is assimetric. It can also be seen that in four varibales (BH, BMI, Fat%, upperarmsf) the values are negative, which means that male pupils from the city center have above average values in those variables. From the kurtosis values in the same table it can be concluded that we have a flattened ditribution, platykurtic curve, which means that the subjects have different values of the variables. There is an exception in only one variable: back skin fold (backsf).

Table 1. Descriptive statistics of male pupils (N=34) from city center

variables	Minimum	Maximum	Mean	SD	Skewness		Kurtosis	
BH - height	135,0	167,0	153,691	8,8292	-,061	,403	-1,007	,788
BM - weight	26,4	73,1	49,844	11,7244	,211	,403	-,660	,788
BMI	14,5	27,9	21,012	4,0894	-,078	,403	-1,328	,788
Fat%	6,4	40,0	23,465	9,3154	-,209	,403	-1,014	,788
upperarmsf	6,0	33,0	19,971	8,2370	-,043	,403	-1,238	,788
backsf	4,0	32,0	11,441	6,9159	1,570	,403	2,052	,788
abdsf	4,0	40,0	22,368	11,6926	,093	,403	-1,366	,788
BMI+sum	28,5	128,4	74,791	28,8693	,176	,403	-1,086	,788

Tabel 2 shows the results of the statistical analysis of male pupils from the suburbs (N=59), with these varibales: minimum, maximum, mean, standard deviation, skewness and kurtosis. According to the results of the skewness it can be concluded that in 7 out of 8 variables the ditribution is simetric. Only in one variable, backsf (back skin folds), the distribution is assimetyric. It can also be seen that almost all varibales have positive values which means that male pupils from the suburbs have lower than average values in those variables, which can be confirmed in chart 1. From the kurtosis values in the same table it can be concluded that we have a flattened ditribution, platykurtic curve, which means that the subjects have different values of the variables. There is an exception in the same variable: back skin fold (backsf).

In both tables, 1 and 2, it can be seen that pupils from the city center are taller, heavier, have bigger values in abdominal and upper-arm skin fold thicknesses and in the sum of BMI and 3 skin folds, although statistically not significant. But pupils from the suburbs have a little “advantage” in percentage of fat (24%) in comparison to pupils form the city center (23%), again statistically not significant.

Table 2. Descriptive statistics of male pupils (N=59) from the suburb (Radishani)

variables	Minimum	Maximum	Mean	SD	Skewness		Kurtosis	
BH - height	134,5	167,0	151,534	7,7336	,028	,311	-,572	,613
BM - weight	28,9	75,6	48,676	12,0928	,429	,311	-,737	,613
BMI	14,5	29,5	21,041	4,1952	,297	,311	-1,164	,613
Fat%	6,0	41,1	24,544	9,1537	-,130	,311	-1,163	,613
upperarmsf	6,0	40,0	18,441	8,5647	,398	,311	-,771	,613
backsf	4,0	33,0	11,085	6,6573	1,202	,311	,979	,613
abdsf	6,0	40,0	20,712	12,0688	,286	,311	-1,476	,613
BMI+sum	31,5	124,5	71,278	29,8193	,295	,311	-1,434	,613

Univariate analysis of variance (ANOVA) between male pupils from center and from suburb is shown in table 3. It can be seen that there are no statistically significant differences between the two groups. There

might be several reasons for that. First, the school in the city center is not only attended by pupils who live there, but also by children from other settlements who are brought by their parents, and due to their late working hours, sometimes by their grandparents, who live near the school, where the children can go after finishing class. Second, nowadays, children even in the suburbs, don't play outside, on the street, like the generations in the past did. So, now they are not physically active and most of them have sedentary life style and are mostly preoccupied with mobile phones. That means that in both settlements (the center and the suburb) children spend their free time equally, sitting with the mobile phone or by the TV and being inactive. The third reason might be inappropriate nutrition. According to WHO (World Health Organization) obesity appears among poorer people, due to lack of money and wrong choices of food that will fill in the stomach and lasts longer. But obesity appears among rich people too, because of availability of food in those families and again because of wrong choices of food. So maybe, the reason might be different, but the percentage of obesity is similar in both settlements.

In table 4 the percentage of pupils in every category are shown. It can be seen that the percentage of pupils in average and under average values (first three columns) are similar. Even the total percentage of pupils with over average values (last two columns) are similar (45% obese pupils in the city center and 42% in the suburb). But with an analysis of both categories, it can be seen that in the city center school most of the pupils (31%) are in the first category (from 85 to 95 percent) which means that they are overweight, and 14% in the category of obese (over 95 percent). In the suburb school nearly 19% are overweight and 23% are obese. Anyhow, in total 43% of the pupils have increased weight, which is really extreme in comparison with Nordic countries where only 5% of peers are obese.

Table 3. Univariate differences (ANOVA) between male pupilsfrom center (N=34) and male pupils from suburb (N=59)

variables		Sum of Squares	df	Mean Square	F	Sig.
BH - height	Between Groups	100,383	1	100,383	1,512	,222
	Within Groups	6041,440	91	66,389		
	Total	6141,823	92			
BM - weight	Between Groups	29,418	1	29,418	,206	,651
	Within Groups	13017,891	91	143,054		
	Total	13047,309	92			
BMI	Between Groups	,018	1	,018	,001	,974
	Within Groups	1572,658	91	17,282		
	Total	1572,676	92			
Fat%	Between Groups	25,129	1	25,129	,296	,588
	Within Groups	7723,423	91	84,873		
	Total	7748,552	92			
upperarmsf	Between Groups	50,487	1	50,487	,708	,402
	Within Groups	6493,513	91	71,357		
	Total	6544,000	92			
backsf	Between Groups	2,740	1	2,740	,060	,807
	Within Groups	4148,959	91	45,593		
	Total	4151,699	92			
abdsf	Between Groups	59,136	1	59,136	,415	,521
	Within Groups	12959,756	91	142,415		
	Total	13018,892	92			
BMI+sum	Between Groups	266,230	1	266,230	,306	,581
	Within Groups	79076,469	91	868,972		
	Total	79342,698	92			

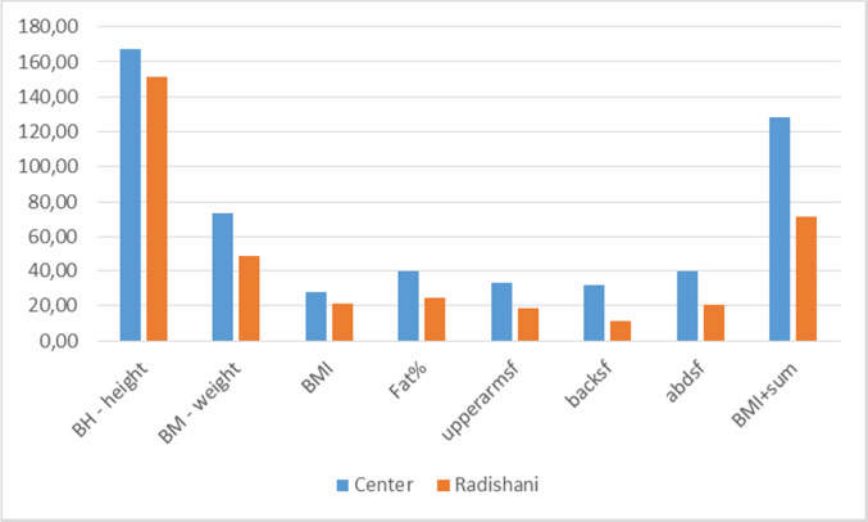
Although the differences between children in both settlement are not statistically significant, we can see in chart 1 that in all 8 variables pupils from the city center have higher values. But in this case, the higher values in 7 variables: weight, BMI, BMI+sum, persentage of fat or skin fold thicknesses are not higher. This means that pupils from the city center still eat more and are less active than their peers from the suburb.

Table 4. BMI (body mass index) per percentile distribution at VI-th grade pupils (male and female) according to Shukova Stojmanovska D., Georgiev G.,& Gonatrev S. (2016)

settlement	extremely under average values (under 5 -th percentile)	under average values (from 5 to 15 percentile)	average values (15 to 85 percentile)	over average values (85 to 95 percentile)	extremely over average values (over 95 percentile)
Center (N-84)	3 (3,6%)	4 (4,8%)	39 (46,4%)	26 (31%)	12 (14,2%)
				38 (45,2%)	
Suburb (N-112)	6 (5,3%)	6 (5,3%)	52 (46,4%)	21 (18,8%)	26 (23,2%)
				47 (42%)	
Total (N-196)	9 (4,6%)	10 (5,1%)	91 (46%)	47 (24%)	38 (19,4%)
				85 (43,4%)	

Greene (quatation Petrović, J., 1992) claims that decreased physical activity is the number one reason for obesity in 67% of obese people and the overeating is participating with only 3%. And according to Wilmore, J.H. & Costill, D.L. (2004), the inactivity is the major reason for obesity, as important as overeating. Dietz, W.H. Jr. & Gortmaker, S.L. (1985) claims that there is a significant association between the time spent in watching TV and the prevalence of obesity. Viner, R.M. & Cole, T.J. (2005) say that every additional hour of TV watching during the weekends at 5 years old children, can increase the risk of adult obesity by 7%.

Chart 1. Graphic presentation of the values of the variables in the city center and Radishani (suburb)



According to Fangchao L., et all (2015), mobile phones, even though excessively used, can help obese older people in decreasing weight and BMI, by using tools and applications for that purpose. Clarke P.,&Evans S.H. (2014) have been exploring how mobile phones helped poor families with 9-14 year old obese children, to provide a healthy meal with the same amount of money as for junk food. Ranucci C., et all (2017) prove that interventions in nutrition with mediteranean diet and increased physical activity with special fitness exercises can decrease weight, BMI and waist circumference in children and teenagers in 6 month period. But pupils usually use mobil phones only for comunications and games, not for learning. They would rather sit with the phones then be active.

Conclusion

Besides the expectations that statistically significant differences will appear due to the settlement where pupils live, however such differences are not present. Besides, it can be seen that pupils in the city center have higher values in all 8 variables, which of course doesn't mean that they have better results. On the contrary, the higher values in 7 variables: weight, BMI, BMI+sum, persentage of fat or skin fold thicknesses, means that the pupils from the city center eat more and run less. But since there is no difference between the two subsamples, it can be concluded that all children are not enough physically active and they

eat more than they need, but the pupils from the city center are even less active and eat more than their peers from the suburbs.

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