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Associations between overweight, health behaviors and Figure Rating Scale by Stunkard at 18-year-old secondary school students from Wrocław

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INTRODUCTION

According to the WHO (World Health Organization) report from 2014, it is estimated that around 1,9 billion adults in the world are overweight (BMI >25 kg/m²), including 600 millions obese. Overweight and obesity of children and youth between 5 and 19 years old, in the year of 2016, was 18% while in 1975 reached 4% [1]. Increase of obese between 2002-2014 were observed in 17 in assessed 26 European countries [2]. During that same time in Poland a steady increase in the number of people with obesity in all age groups, including children and adolescents was observed [2].

However about 15-30% of Polish children in their adolescence presented excessive body mass, and this problem was particularly noticeable in the urban agglomeration [3,4].

In the last several years in Poland, all over the world as well, the attention is being paid to the change of behavior which increase the risk of obesity, especially the ones which are connected with nutrition and the physical activity in leisure time among teenagers.

The primeval obesity are being observed between 98% children who have been diagnosed as obese. Overweight and obesity in adolescence are associated with unfavourable

consequences throughout the life-span, especially in chronic disorders such metabolic syndrome, type 2 diabetes. Diet, physical activity and psychosocial factors are important risk factors of obesity in this group [3,5,6,7].

Nutrition habits and physical activity are determined by social and psychological factors as well, including subjective perception body weight, especially during developmental period [8,9,10,11].

The lack of self-acceptance in regard to one's own body during the developmental period has psychological consequences, and even increase the risk of developing eating disorders and affecting social behavior [12,13]. It has been proved, that obesity is connected with lowering the level of self estimation, feeling of self appreciation and mood disorders [5,14].

Obesity as chronic illness develops through several years, it has been proved as well that negligence behavior of a childhood and in the period of adolescence have their results in obesity and numerous health complications in their adult age [6,15,16,17].

So far, effective prevention programs for obesity and its complications for the population of developmental age have been sought, and the implemented projects indicate a short period of maintaining positive effects.

The prevention programs implemented in Poland and around the world indicate that their effectiveness should also take into account the psychological basis, including the acceptance and perception of body weight, adequate to the actual state [14,18,19]. This gap for the Wrocław population was taken up in the described research.

THE AIM OF THE RESEARCH:

Was to find the relationship between the body mass index (BMI) and diet, physical activity and perception of body mass according to Figure Rating Scale by Stunkard .

MATERIAL AND METHODS

The material of research

In the research 104 adolescent students have taken part from the third year of the 12 Secondary School in Wrocław. Girls were majority (n=84) of the group. The age of the respondents was in the range of 18-19 years. The condition of taking part in the research was explicit permission from a student.

An average body weight of the researched group, without regard to gender was $61,22 \pm 11,36$ [kg], whereas the height of the body was $169,6 \pm 9,22$ [cm]. The body mass index (BMI) was $21,198 \pm 3,01$ [kg/m²].

The organization of the research

In the research the modified questionnaire from the health campaign has been used "Keep straight"[20] "The Golden Cart of The Correct Nutrition"[21] done by the Board of the Promotion Of the Healthy Nutrition and Figure Rating Scale according to A.J. Stunkard [22]. The International Questionnaire of Physical Activity – the short version IPAQ (The International Questionnaire of Physical Activity – the short form) [23]. The anthropometric measurement have been made as well.

The methods of research

Anthropometric research

The anthropometric research is based on the following research specifications: body weight, height, waist and hip circumference. It allowed to calculate the body mass index (BMI) and waist to hip ratio (WHR). Anthropometric measurements have been done with

laboratory scale without wearing clothes and shoes of the ones who have been researched. A height meter and a tape have been used. Each measurement has been repeated three times and the average measurement has been made as well. In the research, selection has been done in accordance with BMI, consistent with WHO, distinguishing normal body mass ($18,5 < \text{BMI} < 25$), overweight ($25 \leq \text{BMI} < 30$) and obesity ($\text{BMI} \geq 30$) [24]. As a correct measurement of the WHR in accordance with WHO the $\text{WHR} < 0,8$ for girls and $\text{WHR} < 0,9$ for the group of boys have been followed [24].

The Figure Rating Scale by A.J. Stunkard

In the research drafts have been followed used in Figure Rating Scale by A.J Stunkard [22]. The drafts contain 9 male and female figures describing figures from the total malnutrition to the extreme obesity. The questioned person pointed at the sketch of figure which suited him best, then it been looked at the difference between the concrete (described on the base of the indicator of body mass) and the figure described by the tested person. Evaluation of the perception of disturbances consists in estimating the arithmetic differences between the person marked as the most proper in comparison with the real figure and the actual BMI. If the differences were up to one sketch the classification was regarded as correct.

In order to estimate the level of physical activity International Physical Activity Questionnaire – short version IPAQ (International Physical Activity Questionnaire – short form) has been used. Questionnaire contains 7 questions in regard to physical activity in the last week before the research. Based on IPAQ, it is being specified how big amount of energy has been used in a specified week (MET – min/week). And the researched people have been classified in the proper level of physical activity: low (L), moderate (M) or high (H).

Assessing knowledge and eating habits

The estimation of the principals in regard to the correct nutrition has been based on the questionnaire of the author. It has been decided that in cause of the incorrect answers (at least two incorrect answers out of four questions) the knowledge of that person is regarded as insufficient (and ascribed him with 0 level). The estimation of the nutrition habits has been taken into consideration as well. In cause of two correct answers out of three above mentioned questions, the declared nutrition habits were regarded as correct (classified as 1).

Statistical methods

The data were analyzed using the Statistica v 12 statistics package. Continuous variables were first analyzed for the normal distribution using the Shapiro-Wilk test. All values are expressed as means \pm standard deviation (SD) as well as medians and 95% CI.

The analysis of the received data have been carried out with by the Student or U Mann-Whitney tests. Associations between variables were analysed by the Spearman rank order correlation or Pearson test. Statistically fundamental have been accepted those values which stayed on the level $p < 0,05$. For the quantitative data, descriptive statistic has been followed, whereas for the qualitative data mediana and dispersion method were followed. The calculation has been made in regard to the quantity of the appearances of the excessive body mass (%) in the whole of the researched group, the dependence on gender was included. In the analysis of the interest data the tests of χ^2 has been followed. For the analysis of many dates' and their causality-consecutive connections with the appearance of obesity, the logistic regression method has been in use.

THE RESULTS

The structure of the body mass index in the whole examined group and with regard to gender is presented in the table. 1.

Table 1. Body Mass Index (BMI) in the Studied Group

Estimation BMI	Girls		Boys		Whole Examined Group	
	N	%	N	%	N	%
Underweight	4	4,76	2	10,00	6	5,77
Correct mass body	70	83,33	15	75,00	85	81,73
Overweight	10	11,90	3	15,00	13	12,50

In the studied group obesity was not observed, whereas overweight was reported by 12.5%, whereas the underweight was 5.8%.

Majority of the researched girls group (n= 84) had correct BMI, while overweight presented 11,9% and underweight 4,76%. In the studied group of boys (n = 20), overweight was observed in 15% and underweight in 10%. Differences in the incidence of abnormal body weight between girls and boys were not significant.

There was no significant difference between the number of girls and boys presenting correct level of knowledge in regard to healthy nutrition recommendation (74% vs 77%) and the nutrition model presented by both groups (71% vs 65%).

The analysis of the level regarding physical activity in accordance with questionnaire IPAQ has allowed to indicate that majority in the researched group realized high (H) or moderate level (M) of the physical activity (properly 55% vs 37 %), and only 10% of the low level (L). The boys more often presented high level in comparison to girls (properly 55% vs 33%), but this differences were not significant. The body mass index perception analysis showed that majority (78%) have done correct evaluation. That number was bigger in the girls group (81% vs 65%).

Furthermore, students with the proper BMI more often indicated correctly their mass body (85%) but in the overweight group only 46%.

Majority girls (86%) and boys (67%) with BMI < 25 kg/m² showed the correct sketch of own figure in Figure Rating Scale by Stunkard but only 50% overweight girls.

Perceptions on the BMI according to nutrition habits in the whole group and dependence on the gender as well (Table 2).

Table 2. The frequency of the correct perception of BMI in dependence on the nutrition model

The correct nutrition habits	Incorrect estimation of the real figure by Stunkard's Figure Rating Scale	Correct estimation of the real figure by Stunkard's Figure Rating Scale	p
The whole group (n=104)	16%	84%	<0,05
The group of girls(n=84)	13%	87%	<0,05
The group of boys (n=20)	31%	69%	NS

NS, not significant

Students who presented healthy nutrition habits selected more often the figures appropriate in Figure Rating Scale by Stunkard and the differences were statistically significant.

The relationship between the level of physical activity and the normal diet model in the study group was shown in Table 3.

Table 3. The frequency of physical activity level by IPAQ in comparison with the nutrition habits

Nutrition habits	Physical activity level			p
	L	M	H	
Correct nutrition habits The whole group (n=104)	8%	56%	36%	NS
Correct nutrition habits in the girls group (n=84)	8%	60%	32%	NS
Correct nutrition habits in the girls group (n=20)	8%	38%	54%	NS

NS, not significant, L- low physical activity level, M-moderate physical activity level, H- high physical activity level

High and Moderate physical activity level presented the highest number of correct nutrition habits (92%).

Relationship between nutrition habits, physical activity, anthropometric indicators (BMI, WHR) are presented in Table 4.

Table 4. Association and the self estimation of the figure according to Figure Rating Scale by Stunkard in the group (n=104)

Variables	The correct nutrition habits
The level of the physical activity (MET/week)	r= - 0,02
BMI (kg/m ²)	r= -0,12
WHR	r= - 0,03
Self estimation of a figure according to Figure Rating Scale by Stunkard	r= 0,21

We found a significant correlation only between nutrition habits and estimation of self-assessment figure by Stunkard's Figure Rating Scale (r=0,21 ; p<0,05)

The association between anthropometric variables (BMI, WHR) , knowledge about healthy diet, nutrition habits are shown in Table 5.

Table 5. The association by Spearman Rank between figure perception by Stunkard's Figure Rating Scale and BMI, WHR and the selected elements of lifestyle in the group (n=104)

Variables	Self estimation of a figure according to Figure Rating Scale by Stunkard
BMI (kg/m ²)	r= -0,22
WHR (cm/cm)	r= -0,08
Knowledge about healthy diet	r= -0,02

Nutrition habits	r= 0,21
The number of declared unhealthy diet elements	r = -0,23

0- incorrect nutrition habits, 1- correct nutrition habits

Significant negative correlation was observed with BMI ($r=-0,22$, $p<0,05$) and the number of declared unhealthy diet elements ($r= -0,23$, $p<0,05$). As well, positive significant correlations have been observed between correct self estimation of mass body according to Figure Rating Scale by Stunkard and the correct nutrition habits ($r= 0,21$; $p<0,05$).

The association between perception of figure by Stunkard's Figure Rating Scale and BMI, physical activity, nutrition habits and number of declared unhealthy diet elements was shown in Table 6 for girls and Table 7 for boys.

Table 6. The correlation between the correct perception of self mass body and BMI and style of life in the girls group (n=84)

Variables	Self estimation of a figure according to Figure Rating Scale by Stunkard
BMI (kg/m ²)	$r = -0,14$
Physical activity (MET/week)	$r= -0,02$
Knowledge about healthy diet	$r= 0,06$
Nutrition habits	r= 0,23
The number of declared unhealthy diet elements	$r= -0,07$

We found significant association between correct self estimation of a figure according to Figure Rating Scale by Stunkard and nutrition habits ($r=0,23$; $p<0,05$) only.

Table 7. The correlation between the correct perception of self mass body and BMI and style of life in the boys group (n=20).

Variables	Self estimation of a figure according to Figure Rating Scale by Stunkard
BMI (kg/m ²)	$r= - 0,43$
Physical activity (MET/week)	r= 0,46
Knowledge about healthy diet	$r= -0,24$
Nutrition habits	$r= 0,12$
The number of declared unhealthy diet elements	r= -0,65

We found significant correlation between an adequate perception of the figure by Stunkard's Figure Rating Scale and the level of physical activity ($r=0,46$, $p<0,05$) and negative correlation between correct perception of figure and the number of declared unhealthy diet elements ($r=-0,65$; $p<0,05$).

In the research the estimation has been done in regard to the risk of the appearance of the obesity depending on the level of the physical activity, the diet model and perception of the figure by Stunkard in the whole, girls and boys.

Table 8. The risk of obesity according to physical activity, the model of nutrition and the perception of figure in the whole group (n=104)

	B	The conventional mistake	Wald	p	Exp (B)
The level of AF (M+H)	,686	,592	1,344	,246	1,986

Nutrition model	1,095	,551	3,952	,047	2,990
The perception of figure by Stunkard	-,111	,552	,041	,840	,895

0- incorrect nutrition model, 1- correct nutrition model

We found that the nutrition model increases the risk of overweight 299% (Exp B = 2,990, $p < 0,046$).

Table 9. The risk of obesity according to physical activity, the model of nutrition and the perception of figure in the girls group (n=84).

	B	The conventional mistake	Wald	Significance	Exp (B)
The level of AF (M+H)	1,458	,840	3,012	,083	4,297
Nutrition model	,935	,664	1,983	,159	2,548
The perception of figure by Stunkard	1,399	,705	3,941	,047	4,050

We found that the perception of figure by Stunkard in girls group increases the risk of overweight 400% (Exp B = 4,050, $p < 0,047$).

Table 10. The risk of obesity according to physical activity, the model of nutrition and the perception of figure in the boys group (n=20)

	B	The conventional mistake	Wald	Significance	Exp (B)
The level of AF (M+H)	-,360	1,211	,088	,766	,698
Nutrition model	1,380	1,094	1,590	,207	3,975
The perception of figure by Stunkard	,277	1,238	,050	,823	1,319

According to the results of the Table10 in the boys group none of the researched data had the statistically significant influence on BMI value .

DISCUSSION

An important role in the prevention of obesity is played by education and preventive or health promotion programs [18,19]. The essential importance in the modern way of health education is to mould the healthy nutrition model and encouragement of physical activities in free time. Realization of programs in regard to the specific communities and with no doubt to them belong school environment of urban agglomeration, as the base is accepted the diagnosed behavioral factors of obesity risk, which will be the aim of future modifications.

In the group researched by us, 18-19 years old secondary school students from Wroclaw, the obesity has not been noticed, whereas overweight represented 12,5%, underweight 5,8%. The analysis of the results including gender allowed to discover the overweight of 11,9 % researched girls and 15% of boys. In the researched group, part of the students underweight 4,76 % with the girls and 10% with the boys. These differences were not statistically essential. Similar results have been shown by another authors, researching youth 16-17 years old in

the Rzeszowski district. The excessive mass body has been found with 15,7% of the whole group but the boys had that problem more often [25].

Next, during an earlier research with youth 16-19 years of age in the year 2010, in Kalisz district, overweight has been discovered with 9% which confirms the increasing trend in regard to the excessive mass body in Poland in this aged group [26]. In the research of the population of the school children of the Primary Schools, 12-13 years of age in the year 2016, more frequent causes regarding obesity have been displayed in the girls group in comparison with the boys group (26% vs 20%), which points at changeable trends of the excessive mass body in the developing age [27].

Among the researched 842 students 16-17 years old in Lodz region it has been confirmed that more often excessive mass body occurred in the boys group than in the girls. In Łęczyca the result was as follows 15,7% vs 5,4%, while in Zgierz 14,5% vs 9,8% [3].

Many of the authors have confirmed the correlations between diet and unhealthy diet with excessive risk of overweight and obesity [15,16,17].

In our research the correct nutrition habits presented 71% girls and 65% boys, while that number was higher than in the researches done by other authors. The analysis of health behaviors of the youth in Wielkopolskie region has allowed to make a statement that the students from the country agglomeration make the nutrition mistakes more often than in comparison with the ones who live in town [28]. Next, in the research regarding the quality valuation of the menu used by the youth living in Warsaw territory, 1024 students took part in the research, it has been noticed that only 12% were able to make properly composed menus [29]. The other authors carrying out the research in the Podkarpacie region didn't indicate significant differences between the nutritional behaviors of the sport students and in general [30]. In the adolescence period, except changing the nutrition habits, it is being observed the lowering the level of the physical activity in the leisure time as well [2,4,8].

The majority of the researched by us students have presented the suggested healthy level of the physical activity ie. moderate or high. In the researched group the moderate level of the physical activities presented 53% of the respondents, the high level 37%, and only 10% the low level.

Analysis of the physical activity has been shown the insufficient level of the physical activity both in the population in general like in the younger youth groups. WHO calculates, that globally 23% adults and 81% young people (11-17 years of age) don't present the advisable level of the physical activity, which was the reason to impose the strategy" The Global Action Plan on Physical Activity 2018 -2030" [31]. In the research of the polish authors is shown the high frequency of the low level of the physical activity in the youth group [25,32].

In our research the moderate level of physical activity has been shown in 57% of the girls and 35% of the boys, whereas the high level respectively 33% vs 55%. Higher frequency of the appearance of the high level of the physical activity in the boys group have indicated other polish authors as well [32,33] and in the world [34,35]. In the research with the usage of the IPAQ questionnaire proceeded in Polish Schools in Latvia has been shown that the level of total physical activity of the boys increases together with age, whereas with the girls the declining tendency is noticed. In the boys group the highest number of the researched participants representing the high level of the physical activity have referred to the age of 17 years of age - 59,5% and 1 years of age - 43,2% (in girls group 16 years of age 32,4%) [36].

Many authors [26, 37, 38, 39] pay attention at the role of the psychological factors, like the perception of own figure in the development of the obesity. It has been noticed that

already at the age of 7-8 obese children have the tendency of the incorrect estimation of its own mass body [40].

In the presented research the analysis has been done regarding the perception of its own figure, based on the test according to Stunkard [22]. The correct perception indicated 78% of the students. The girls more often estimated correctly their own figure than boys (81% vs 65%). But it is good to notice, that boys group was lower than the girls one. The perception of its own figure differed in dependence of BMI.

In the group of the students with the correct indicator of the mass body, majority of them (82%) have correctly estimated the figure, whereas the students with the overweight 46%. The girls with the correct mass body, more often estimated correctly their own figure (88,2%) than the boys (76,9%).

In the researched group with the correct perception of figure (with no regard to gender), 86,4% constitute the people with the correct mass body. The results of the research indicate at the appearance of dependency between the correct mass body perception and the BMI. Stunkard et al. in the proceeded research had indicated the difference as well in the perception of its own figure among the people with the correct mass body and with the overweight and obesity [22]. The obese people significantly more often displayed the tendency to the incorrect assessment of its own figure. In the research of the other authors proceeded with the afroamerican teenaged, noticed, that only 27,2% of people with the overweight presented the correct perception of mass body [41].

In the group of the students presented the correct nutrition habits, majority (84%) have correctly assessed figure. This tendency is confirmed in another researches, where to the analysis submitted the behavior of the healthy polish teenagers [26,49].

In the carried out research, it has been indicated the statistically essential correlation between the correct perception of the mass body and nutrition habits ($r=0,23$; $p<0,05$). There was no indication however of the essential correlations between the perception and the level of the physical activity, the number of nutrition mistakes, the level of the knowledge about nutrition, and the value of the BMI indicator.

It has been indicated as well the negative correlation of the value of the BMI indicator with the self estimation of a figure according to Stunkard ($r= -0,22$; $p<0,05$). The similar dependence has been indicated by other authors as well [22, 42, 43]

Higher coefficient of correlation between the mass body and the correct perception of a figure has been indicated with the older youth at 14-15 years old in comparison with the youth (10 - 12 years old). In the research in 2008, 771 students has taken part from the Primary and the Secondary Schools In Poland [42].

In the boys group the positive correlation has been displayed between correct perception of the mass body and the level of the physical activity ($r=0,46$; $p <0,05$). Such dependences were not indicated in the girls group. The similar dependence have been indicated in the research of the 100 women 20-70 years old in Małopolska region [44]. The authors displayed the correlation between the self estimation of a figure with the researched women who were satisfied with their own mass body indicators as the fulfillment of their expectation in regard to the ideal figure.

In the researches by us the group of boys the negative correlation between the self estimation of a figure according to Stunkard and the number of the declared nutrition mistake ($r=-0,65$, $p<0,005$).

Taking in to account multi-functional etiopatogenesis of obesity, in the research the model of the logistic regression has been used, analyzing in that way the influence of the several behavioral factors (the level of the physical activity, correct nutrition habits, the correct estimation of its own figure) on the values of the mass body indicator. It has been indicated the essentially statistic correlation between the correct nutrition model presented by

youth (n=104) and the correct the BMI indicator ($p<0,05$). It has been confirmed than the displayed earlier by other authors , the influence of the correct nutrition model on the correct mass body indicator [11, 13, 17,8, 25, 30].

In the examined group of girls, it was shown that the correct perception of body weight decreases three times, the risk of overweight ($p=0,047$). It have confirmed indicated by other authors influence of the figure perception on the risk of the obesity for the adolescent time and for the adult life as well [11, 22, 41].

Limitations:

This work concerned young people living in a metropolitan agglomeration with specific socio-cultural conditions. The full picture on the etiology of obesity in this group should also include young people from other agglomerations, which requires further research. A certain drawback is also the number of examined boys (n = 20) which resulted from demographic conditions independent of the authors of the work.

THE CONCLUSIONS

1. Most secondary students of the metropolitan area represented the recommended level of physical activity and prefer the correct model of nutrition regardless of gender.
2. High physical activity is a stimulator of healthy eating behaviors in the youth group.
3. There is a relationship between the nutrition model, body mass perception and the BMI.
4. Figure perception has an impact on the risk of obesity, in the group of 18-19 secondary students from Wrocław, especially girls.

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