Progress in Nutrition 2019; Vol.21, N. 4: 1003-1010 DOI: 10.23751/pn.v21i4.8943

Influence of food behavior and physical activity in relation to the overall physical condition of Romanian students

Catalin Vasile Savu[1], Aurelian Gheorghiu[1], Marius Trandafir[1], Cristian Serea[2], Octavian Barna[2]

[1]Faculty of Physical Education and Sport, "Dunarea de Jos" University of Galati, Galati, Romania; [2]Faculty of Food Science and Engineering, "Dunarea de Jos" University of Galati, Galati, Romania - E-mail: octavian.barna@yahoo.com

Summary. The aim of the present study was to determine the influence between food behavior and physical activities in relation to the overall physical condition of Romanian students. The research study was conducted on a group of athletic and non-athletic students from one college and two faculties from Galati County, in Romania. For this purpose, a cross-sectional analysis of data was processed from a representative sample of 1,214 students aged between 19 and 25 years old who answered a self-reported diet history questionnaire (DHQIII) questionnaire to establish their food habits quantified in healthy eating index (HEI) 2015 score and self-administered international physical activity questionnaire (IPAQ) questionnaire to assess their physical activity. The EUROFIT test battery was used to determine the overall physical condition of the subjects. Within this study, after 3 weeks of the initiation of the main study, a different subgroup of 228 subjects aged 19 ± 25 years old also participated in an ancillary study including an interview about their physical activities and an interview with a dietician before completing IPAQ and DHQIII questionnaires. The objective was the determination of the overall physical condition of the subjects that have used EUROFIT tests battery. To express the students' overall performance in one score, it was calculated a total test score. The percentage of athletic male students overall involved in intense sports activities was 26.72% which was higher with 3.8% than the percentage of athletic female students (22.92%) tested in the main study. Median values of combined activities were expressed in metabolic equivalent min/week and ranged from 394.12 to 5586.44 for male students and from 412.53 to 4318.81 for female students. For the food habits, the median values for the HEI) score ranged from 50.4 to 55.1 for male students and from 51.3 to 54.2 for female students surveyed in the main study. Body fat percentage median values ranged from 22.6 to 16.2 for male students and from 28.6 to 20.1 for female students and body mass index median values ranged from 23.64 to 21.02 for male students and from 22.14 to 20.19 for female students that participated in the main study. The multivariate analysis of the results showed a strong correlation between their food habits and their overall physical conditions. The Pearson correlation coefficient between the HEI and total Eurofit test score values had the value $p = 0.046 < 0.05$ for male students and $p = 0.044 < 0.05$ for female students tested in the main study. The statistical analysis showed that there are strong positive correlations between the indices calculated in the main study and those in the ancillary study. Students with a healthy diet and high physical activity have had a higher overall physical condition than sedentary students or those with less healthy eating habits.

Key words: Physical activity, food habits, HEI 2015 score, BMI

Introduction

Physical activity and eating behavior are the most important factors that influence the health of people (1–3). The technical progress of the last decades has decreased considerably the physical activity of the students and increased the risk of developing cardiovascular diseases (3,4). Although most studies concluded that sustained physical activity contributed to good health, the assessment of physical activity and quantifying the effect on health is still in the researchers' attention (5–7). Another decisive factor in ensuring good health is nutrition (8–10). For various reasons, many students adopt an unhealthy diet and gain weight (11,12). The most frequently cited reasons, why students have an unhealthy diet, are lack of time, limited financial resources, culinary preferences, and the ability to cook on their own (13–15). In some cases, students would like to adopt a healthy diet, but the lack of the necessary knowledge does not give them the possibility of doing so (15). In many cases, nutrition information reached to the students through media channels, especially TV channels, but these shows have had a commercial side and have not provided sufficiently nutritionally accurate information (16,17). These things suggest the need to promote knowledge among students about the effect and importance of eating habits and physical activity on health.

The objective of the present study was to determine the influence between food behavior and physical activities in relation to the overall physical condition of a group of Romanian students from Galati University.

Materials and Methods

In this survey, anonymous self-administered questionnaires were distributed to a representative sample of 1,214 athletic and non-athletic students, males and females, aged between 19 and 25 years old (with an age median value of 22.6 years old) from one college and two faculties from Galati county, in Romania. Three kinds of variables were recorded during the study: anthropometric measures, fitness stage, assessed by EUROFIT tests (18), and self-reported data including food habits, various types of physical activities, health status, and lifestyles. After 3 weeks of the main study, a subgroup of 228 subjects aged 19 ± 25 years old (with an age median value of 22.3 years old) also participated in an ancillary study including an interview about physical activities and an interview with a dietician before completing an anonymous questionnaire called International Physical Activity Questionnaire (IPAQ) (19) to assess their physical activity and a self-reported anonymous diet history questionnaire (DHQIII) (20) to establish their food behavior and the determination of overall physical condition of the subjects was assessed using Eurofit Physical Fitness Test Battery (EUROFIT).

Anthropometric measurements

Anthropometric measurements were used in this study to calculate the body mass index (BMI) and body fat percentage of the subjects. To calculate the BMI index, the height and weight of the subjects were measured (21). A stadiometer device Seca 217 (Seca, Germany) was used to measure body height. The measurement was made with a precision of ± 0.1 cm, the subjects found in bare feet. The weight of the subjects was measured by weighing with an accuracy of ± 0.1 kg and was performed with an electronic medical scale Wunder (Wunder, Italy).

Skinfold test was used to measure body fat percentage. Measurements were performed with a Holtain skinfold caliper (Holtain, UK) by measuring subcutaneous tissue at four points (biceps, triceps, subscapular, and suprailiac skinfold). The measurements were performed on the right side of the body (21).

Food behavior

The evaluation of the students' eating habits was made using the healthy eating index (HEI) 2015 index proposed by the US Department of Agriculture (22). The HEI 2015 score evaluates 13 food groups from the diet components resulting in a score ranging from 1 to 100. The closer the score from the calculation is to 100, the more nutritionally appropriate the diet. To calculate the HEI 2015 index, the subjects completed DHQIII self-reported questionnaires.

Physical activity (PA)

The physical activity of the subjects was determined based on the IPAQ questionnaire, the short

version, translated into Romanian. Physical activity was expressed in metabolic equivalent (MET) min/week. According to the number of METs resulting from the sum of the activities declared in the questionnaire, the participants in this study were divided into three categories: **a**. Students with physical activity <600 MET min/week (low sports activity level), **b**. Students with physical activity between 600 and 2,999 MET min/week (moderate physical activity level), and **c**. students with physical activity> 2,999 MET min/week (high physical activity level).

Overall physical condition

EUROFIT tests were used to determine the overall physical condition of the subjects.

Eurofit test battery was performed according to the protocols in the Eurofit manual (18). The following tests were used: flamingo balance, plate tapping, sit-and-reach, standing broad jump, standing broad jump, handgrip strength, sit-ups bent arm hang, 10×5 m agility shuttle run, and the 20 m shuttle run (18). All tests were performed on the same day between 8.00 am and 2.00 pm.

Statistical analysis

In order to express the results from all Eurofit tests performed in a single score, the method described by Fjørtoft et al. (23) was applied. Moreover, by applying the Kolmogorov–Smirnov tests, it was determined that the scores obtained after the conversion of the results have a normal distribution. For each test to have the same weight in the overall score, all scores were transformed into z scores based on the sample mean calculation and the standard deviation. The total score was then calculated for each student as the average of the z scores of all the tests performed (23). All analyses were conducted with the use of SPSS Version 23 for Windows (SPSS, USA). For continuous variables, it was calculated the means and standard deviation and percentages for definite outcomes. The significance level was set to 0.05. The difference in results was considered statistically significant when a p value obtained was less than or equal to 0.05.

Results and Discussions

One of the results of this present survey was that the male students participated in a higher percentage of intense physical activity than female students.

The percentage of athletic male students overall involved in intense sports activities was 26.72% which was higher with 3.8% than the percentage of athletic female students (22.92%) tested in the main study (Table 1). The same tendency of male subjects to engage more in sports activities than female subjects was found in other studies (24,25).

Eurofit tests results

In order to estimate the internal consistency of the Eurofit test battery for the main study, Cronbach alpha value was calculated and the value 0.788 was obtained. This value confirmed the correctness of the test set based on which the final score was calculated.

Because the Cronbach alpha value is based on the correlations between the values of the items that make up the battery of samples administered to the subjects, in Table 2 are presented the values of the correlation coefficients and the associated probabilities for each pair of items, but also for the final score with each item. Analyzing Table 2, it can be seen a very good correlation between the variables analyzed for most variables with ($| r |> = 0.610$ and $p < 0.05$).

The internal consistency of the test set was also confirmed for the ancillary study (Cronbach's alpha =

Table 1. Distribution of students participating in the main and ancillary study by gender and PA levels.

		Main study			Ancillary study		
		Male students	**Female students**	**Total**	**Male students**	**Female students**	**Total**
		625 (51.5%)	**589 (48.5%)**	**1,214**	**127 (55.70%)**	**101 (44.30%)**	**228**
Sport activity level	Low	194 (31.04%)	198 (33.62%)	392 (32.29%)	38 (29.92%)	34 (33.66%)	72 (31.58%)
	Moderate	264 (42.24%)	256 (43.46%)	520 (42.83%)	54 (42.52%)	44 (43.57%)	98 (42.98%)
	Intense	167 (26.72%)	135 (22.92%)	302 (24.88%)	35 (27.56%)	23 (22.77%)	58 (25.44%)

Table 2. Main study Pearson correlation coefficients between individual test item scores and total test scores.

		Score	Flamingo Balance, number	Plate tapping, sec	Sit and reach, cm	Standing broad jump, cm	Grip strength, kg	Sit-ups, number	Bent arm hang, sec	Shuttle run 10 × 5 m, sec	VO2, max ml.kg^{-1} min−1
Score	Pearson Correlation	1									
	p										
Flamingo Balance, number	Pearson Correlation	0.868*	1								
	p	0.025									
Plate tapping, sec	Pearson Correlation	0.753	0.895*	1							
	p	0.048	0.016								
Sit and reach, cm	Pearson Correlation	−0.642	−0.610	−0.870*	1						
	p	*0.040*	*0.038*	*0.024*							
Standing broad jump, cm	Pearson Correlation	−0.947**	−0.957**	−0.806	0.583	1					
	p	0.004	0.003	0.043	0.029						
Grip strength, kg	Pearson Correlation	−0.839*	−0.823*	−0.515	0.192	0.878*	1				
	p	0.037	0.044	0.029	0.046	0.021					
Sit-ups, number	Pearson Correlation	−0.883*	−0.891*	−0.936**	0.855*	0.898*	0.647	1			
	p	0.020	0.017	0.006	0.030	0.015	0.045				
Bent arm hang, sec	Pearson Correlation	−0.886*	−0.908*	−0.787	0.572	0.940**	0.865*	0.912*	1		
	p	0.019	0.012	0.044	0.023	0.005	0.026	0.011			
Shuttle run 10x5m, sec	Pearson Correlation	0.899*	0.981**	0.943**	−0.740	−0.952**	−0.764	−0.960**	−0.924**	1	
	p	0.015	0.001	0.005	0.047	0.003	0.046	0.002	0.008		
VO2, max ml.kg -1min-1	Pearson Correlation	−0.900*	−0.959**	−0.939**	0.766	0.946**	0.748	0.982**	0.946**	−0.994**	1
	p	0.014	0.002	0.006	0.044	0.004	0.037	0.000	0.004	0.000	

*Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed).

0.783). This conclusion also resulted from the values of the correlation coefficients calculated for the total score and each variable entering its calculation, or for each pair of variables separately ($p < 0.05$) (Table 3).

Food behavior and overall physical conditions

Students evaluated in the main study who reported a healthier diet represented by the HEI index obtained better results in the physical evaluation represented in total score (Fig. 1). Similar results have been reported by Croll et al. [26] and Georgiou et al. [27]. For the food habits, the median values for the Healthy Eating Index (HEI 2015) score ranged from 50.4 to 55.1 for male students and from 51.3 to 54.2 for female students surveyed in the main study (Fig. 1).

The Pearson correlation coefficient between the HEI index and total Eurofit test score values had the value r = 0.56, p = 0.046 < 0.05 for male students and r=0.58, $p = 0.044 < 0.05$ for female students tested in the main study.

In the ancillary study, the median values of the HEI index score ranged from 51.2 to 54.6 for male students and from 50.8 to 54.6 for female students (Fig. 2).

The Pearson correlation coefficient between the HEI and total test score values had the value r = 0.54,

Table 3. Ancillary study Pearson correlation coefficients between individual test item scores and total test scores.

		Score	Flamingo Balance, number	Plate tapping, sec	Sit and reach, cm	Standing broad jump, cm	Grip strength, kg	Sit-ups, number	Bent arm hang, sec	Shuttle run 10 × 5 m, sec	VO2, max ml.kg^{-1} min^{-1}
Score	Pearson Correlation	1									
	p										
Flamingo Balance, number	Pearson Correlation	0.893*	1								
	p	0.017									
Plate tapping, sec	Pearson Correlation	0.833*	0.889*	1							
	p	0.039	0.018								
Sit and reach, cm	Pearson Correlation	−0.792	−0.633	−0.781	1						
	p	0.046	0.041	0.047							
Standing broad jump, cm	Pearson Correlation	−0.948**	−0.956**	−0.863*	0.731	1					
	p	0.004	0.003	0.027	0.049						
Grip strength, kg	Pearson Correlation	−0.703	−0.866*	−0.648	0.239	0.833*	1				
	p	0.049	0.026	0.044	0.048	0.039					
Sit-ups, number	Pearson Correlation	−0.837*	−0.776	−0.903*	0.957**	0.849*	0.457	1			
	p	0.038	0.048	0.014	0.003	0.033	0.036				
Bent arm hang, sec	Pearson Correlation	−0.898*	−0.954**	−0.918**	0.719	0.982**	0.835*	0.870*	1		
	p	0.015	0.003	0.010	0.047	0.000	0.038	0.024			
Shuttle run 10x5m , sec	Pearson Correlation	0.804	0.889*	0.868*	−0.788	−0.923**	−0.691	−0.912*	−0.946**	1	
	p	0.044	0.018	0.025	0.042	0.009	0.036	0.011	0.004		
VO2, max ml.kg -1min-1	Pearson Correlation	−0.897*	−0.955**	−0.944**	0.782	0.970**	0.771	0.913*	0.991**	−0.966**	1
	p	0.015	0.003	0.005	0.032	0.001	0.034	0.011	0.000	0.002	

*Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed).

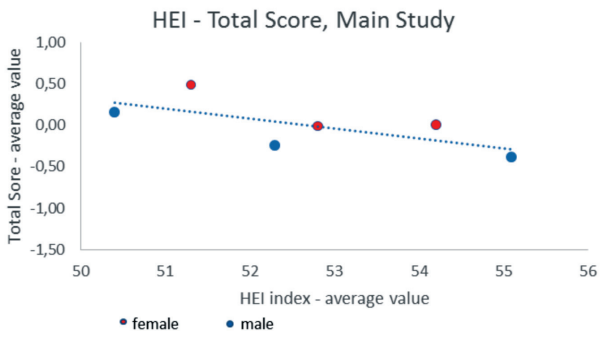

Figure 1. Main study. Male and female students HEI index and total score variation.

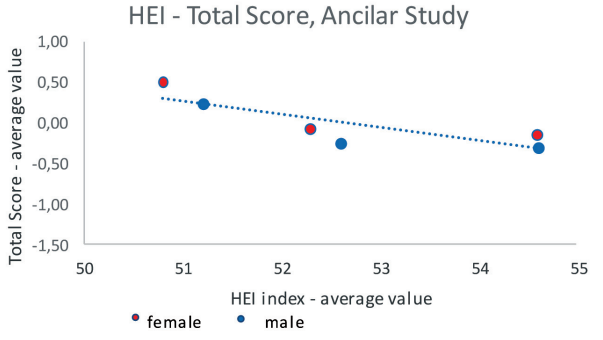

Figure 2. Ancillary study. Male and female students HEI index and total score variation.

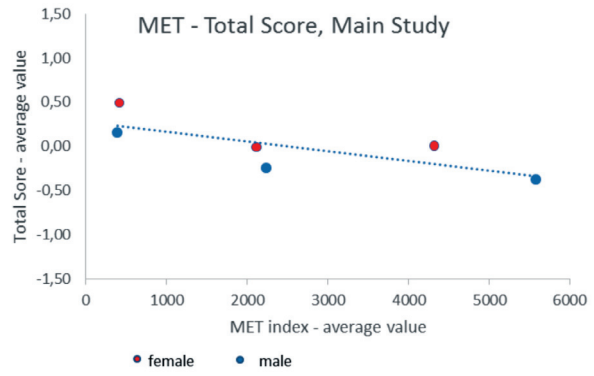

Figure 3. Main study. Male and female students MET index and total score variation.

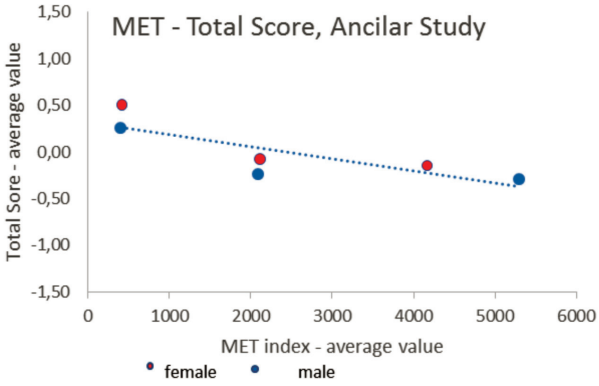

Figure 4. Ancillary study. Male and female students MET index and total score variation.

p = 0.042 < 0.05 for male students and r=0.57, p = 0.045<0.05 for female students tested in the main study.

The values of r >0.5, p < 0.05 obtained for both the main study and the ancillary study certified that it was obtained a good correlation between the scores obtained for HEI score and total score for both male and female students.

Physical activity

As expected, students who practiced more intense physical activity achieved better results in physical tests from the Eurofit battery. Similar results were reported by Cavadini et al. (28), Lee et al. (29), and Carraro et al. (30).

In the main study, median values of combined physical activities were expressed in MET min/week and ranged from 394.12 to 5586.44 for male students and from 412.53 to 4318.81 for female students (Fig. 3).

The Pearson correlation coefficient between the PA expressed in MET and total test score values had the value r=0.72, p = 0.048 < 0.05 for male students and r.6, p = 0.046 < 0.05 for female students tested in the main study.

In the ancillary study, median values of combined physical activities expressed in MET min/week ranged from 409.22 to 5296.44 for male students and from 421.53 to 4162.81 for female students (Fig. 4).

The Pearson correlation coefficient between the PA expressed in MET and total test score values had the value r= 0.75, p = 0.047 < 0.05 for male students and r=0.77, p = 0.045 < 0.05 for female students tested in the ancillary study.

BMI and body fat percentage

Body fat percentage median values ranged from 22.6 to 16.2 for male students and from 28.6 to 20.1 for female students and BMI median values ranged from 23.64 to 21.02 for male students and from 22.14 to 20.19 for female students that participated in the main study (Table 4).

In the ancillary study, body fat percentage median values ranged from 21.9 to 16.3 for male students and from 27.3 to 20.7 for female students and BMI median values ranged from 24.42 to 20.82 for male students and from 25.94 to 20.66 for female students (Table 5).

Table 4. Main study. BMI index and Body fat percentage by gender and PA levels of students.

PA Levels	BMI index, Median value (SD)		Body fat percentage Median value (SD)	
	Male students	Female students	Male students	Female students
Low	23.64 (1.67)	22.14 (1.69)	22.6 (1.69)	28.6 (1.51)
Medium	22.47 (1.53)	21.46 (1.55)	20.3 (1.58)	25.7 (1.61)
High	21.02 (1.57)	20.19 (1.57)	16.2 (1.54)	20.1 (1.48)

Table 5. Ancillary study. BMI index and Body fat percentage by gender and PA Levels of students.

PA Levels	BMI index, Median value (SD)		Body fat percentage Median value (SD)	
	Male students	Female students	Male students	Female students
Low	24.42 (1.61)	25.94 (1.44)	21.9 (1.61)	27.3 (1.54)
Medium	22.85 (1.56)	23.24 (1.65)	19.4 (1.54)	24.5 (1.64)
High	20.82 (1.65)	20.66 (1.53)	16.3 (1.64)	20.7 (1.55)

Similar results have been reported by Brener et al. (31) and Huang et al. (32).

It has been calculated the correlation between coefficients from the main study and the ancillary study. For physical activity (MET index), it was found a very strong positive correlation $r = 0.776$, $p < 0.001 < \alpha = 0.05$. For HEI score for the main study vs ancillary study has resulted in $r = 0.765$, $p < 0.001 < \alpha = 0.05$, also being with a very strong positive correlation. For body composition (BMI index), the results obtained were in the same trend $r = 0.728$, $p < 0.001 < \alpha = 0.05$, also having a very strong positive correlation. For total score, it was found a very strong positive correlation $r = 0.779$, $p < 0.001 < \alpha = 0.05$. These results validate the results obtained in the main study.

Conclusion

These results can be taken into consideration while designing educational programs and interventions. Both male and female athletic students' involvement in PA was associated with better food habits and better BMI indexes for both gender students compared with non-athletic students. The results obtained in the present study confirmed once again that healthy eating and physical activity ensured a good physical form of the students. The percentage of male students involved in sports activities is higher than that of female students. In terms of eating habits, no notable differences were observed between the genders, HEI index falling within the reported limits and in other similar studies. Considering that both eating habits and active or sedentary lifestyles are formed from the period when young people are students, it is recommended to develop educational programs that improve the knowledge about the importance of nutrition and physical activity in students.

Limitations

The survey was limited to samples of 19- to 25-year-old Romanian students. Larger samples in each age and country group are essential for establishing age and sex-specific indexes and correlations

Conflict of interest

The authors declare that they have no competing interests.

Acknowledgments

The authors wish to thank the study participants for their cooperation.

Authors' contributions

All authors contributed equally to this manuscript. All authors read and approved the final manuscript.

References

1. Bouchard C, Shephard RJ. Physical activity, fitness, and health: the model and key concepts. In: Bouchard C, Shepharhd RJ, Stephens T (eds.). Physical activity, fitness, and health. Human Kinetics, Champaign, IL, pp 77–88, 1994.
2. Kemper HCG (ed.). The Amsterdam growth study. A longitudinal analysis of health, fitness, and lifestyle. Human Kinetics, Champaign, IL, 1995.
3. Kohl HW, Craig CL, Lambert EV, Inoue S, Alkandari JR, Leetongin G, Kahlmeier S. The pandemic of physical inactivity: global action for public health. Lancet 2012; 380(9838):294–305.
4. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000. JAMA 2004; 291:1238–45.
5. Haskell WL, Lee I-M, Pate RR, Powell KE, Blair SN, Franklin BA, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Circulation 2007; 116(9):1081–93.
6. Kujala UM. Evidence on the effects of exercise therapy in the treatment of chronic disease. Br J Sports Med 2009; 43:550–5.
7. Pedersen BK, Saltin B. Exercise as medicine - evidence for prescribing exercise as therapy in 26 different chronic diseases. Scand J Med Sci Sports 2015; 25(Suppl 3):1–72.
8. Vereecken C, De Henauw S, Maes L. Adolescents' food

habits: results of the health behavior in school-aged children survey. Br J Nutr 2005; 94(3):423–31.
9. Centers for Disease Control and Prevention. Guidelines for school health programs to promote lifelong healthy eating. J Sch Health 1997; 67:9–26.
10. Steingrimsdottir L, Ovesen L, Moreiras O, Jacob S. Selection of relevant dietary indicators for health. Eur J Clin Nutr 2002; 54(Suppl 2): S8–11.
11. Vella-Zarb R, Elgar FJ. The "freshman 5": a meta-analysis of weight gain in the freshman year of college. J Am Coll Health 2009; 58(2):161–6.
12. Deliens T, Clarys P, De Bourdeaudhuij I, Deforche B. Determinants of eating behavior in university students: a qualitative study using focus group discussions. BMC Public Health 2014; 14:53.
13. Garcia AC, Sykes L, Matthews J, Martin N, Leipert B. Perceived facilitators of and barriers to healthful eating among university students. Canad J Diet Pract Res 2010; 71(2):28–33.
14. Garcia AL, Vargas E, Lam PS, Shennan DB, Smith F, Parrett A. Evaluation of a cooking skills program in parents of young children—a longitudinal study. Public Health Nutr 2014; 17(5):1013–21.
15. Matthews JI, Doerr L, Dworatzek PDN. University students intend to eat better but lack coping self-efficacy and knowledge of dietary recommendations. J Nutr Educ Behav 2016; 48(1):12–9.
16. Clifford D, Anderson J, Auld G. The use of mass media channels on a college campus to disseminate nutrition information. Department of Food Science and Human Nutrition, Colorado State University, Fort Collins, CO, 2004.
17. Lowry R, Wechsler H, Galuska DA, Fulton JE, Kann L. Television viewing and its associations with overweight, sedentary lifestyle, and insufficient consumption of fruits and vegetables among US high school students: differences by race, ethnicity, and gender. J Sch Health 2002; 72:413–21.
18. Claude A, Council of Europe. Committee for the Development of Sport. Council of Europe. Committee of Experts on Sports Research. EUROFIT: handbook for the EUROFIT tests of physical fitness, Italian National Olympic Committee, Central Direction for Sport's Technical Activities Documentation and Information Division, 1988.
19. Hagstromer M, Oja P, Sjostrom M. The international physical activity questionnaire (IPAQ): a study of concurrent and construct validity. Public Health Nutr 2006; 9(6):755–62.
20. The Diet History Questionnaire III. Available via https://www.dhq3.org/study/study_id=101/view-questionnaire/
21. Shah NR, Braverman ER. Measuring adiposity in patients: the utility of body mass index (BMI), percent body fat, and leptin. PLoS One 2012; 7(4).
22. National Cancer Institute, Division of Cancer Control and Population Sciences. Comparing the HEI-2015, HEI-2010, and HEI-2005. Available via https://epi.grants.cancer.gov/hei/comparing.html
23. Fjørtoft I, Pedersen AV, Sigmundsson H, Vereijken B. Measuring physical fitness in children who are 5 to 12 years old with a test battery that is functional and easy to administer. Phys Ther 2011; 91(7):1087–95.
24. Leisure-time physical activity in university students from 23 countries: associations with health beliefs, risk awareness, and national economic development. Prev Med 2004; 39(1):182–90.
25. Pinto BM, Marcus BHA. Stages of change approach to understanding college students' physical activity. J Am Coll Health 1995; 44(1):27–31.
26. Croll KJ, Neumark-Sztainer D, Story M, Wall M, Perry C, Harnack L. Adolescents involved in weight-related and power team sports have better-eating patterns and nutrient intakes than non-sport-involved adolescents. J Am Diet Assoc 2006; 106(5):709–17.
27. Georgiou C, Betts N, Hoos T, Glenn M. Young adult exercisers and nonexercisers differences in food attitudes, perceived dietary changes, and food choices. Int J Sport Nutr 1996; 6:402–13.
28. Cavadini C, Decarli B, Grin J, Narring F, Michaud P-A, et al. Food habits and sport activity during adolescence: differences between athletic and non-athletic teenagers in Switzerland. Eur J Clin Nutr 2000; 54(1):16–20.
29. Lee IM, Paffenbarger RS, Hennekens CH. Physical activity, physical fitness, and longevity. Aging Clin Exp Res 1997; 9(1):2–11.
30. Carraro A, Scarpa S, Ventura L. Relationships between physical self-concept and physical fitness in Italian adolescents. Perceptual Motor Skills 2010; 110(2):522–30.
31. Brener ND, Eaton DK, Lowry R, McManus T. The association between weight perception and BMI among high school students. Obes Res 2004; 12:1866–74.
32. Huang TT-K, Harris KJ, Lee RE, Nazir N, Born W, Kaur H. Assessing overweight, obesity, diet, and physical activity in college students. J Am Coll Health 2003; 52(2):83–6.

Correspondence:
Barna Octavian
Faculty of Food Science and Engineering,
"Dunarea de Jos" University of Galati, Galati, Romania.
E-mail: octavian.barna@yahoo.com