

The relationship between physical activity and food habits of students. A case study

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Summary. The current study evaluated the relationship between physical activities and the food habits of a group of students from Galati County, in Romania. A cross-sectional study design was used to achieve the objectives. A total of 1,346 subjects, male and female students aged between 19 ± 25 years old answered a self-reported anonymous International Physical Activity Questionnaire to assess their physical activity and a self-reported anonymous Diet History Questionnaire III to establish their food habits quantified in Healthy Eating Index (HEI) 2015 score. Anthropometric measurements were used to calculate the body mass index (BMI) of the subjects. Within this study, randomly selected different subgroups of 246 subjects, also male and female students, aged between 19 ± 25 years old also participated in an ancillary similar study with 1-day dietary tracking, evaluated by a dietician. The percentage of overall male students involved in intense sports activities was 28.02%, which was higher with 5.12% than the percentage of athletic female students (22.9%) tested in the main study. Median values of combined activities were expressed in metabolic equivalent task (MET)·minute/week, ranged from 421.86 MET minute/week to 5472.87 MET minute/week for male students and from 384.29 MET minute/week to 4506.62 MET minute/week for female students. For the food habits, the median values for the HEI 2015 score ranged from 51.3 to 54.7 for male students and from 52.2 to 55.3 for female students surveyed in the main study. Indices of fatness and body composition or BMI index values ranged from 24.38 to 21.18 for male students and from 23.87 to 20.64 for female students participated in the main study. The multivariate analysis of the results showed a strong correlation between a high level of physical activity and food habits. The Pearson correlation coefficient between the MET and HEI score values has the value $r = 0.724$ ($p = 0.037$) for boys students and $r = 0.748$ ($p = 0.028$) for girls tested in the main study. The statistical analysis showed that there are strong positive correlations between the indices calculated in the main study and in the ancillary study. The present study identified significant differences in the nutritional knowledge and food habits between the athletic students that had healthier food habits than non-athletic students. The results clearly support the need for developing programs for sports activity to be more accessible for everyone and better-disseminated information regarding health promotion and dietary habits, underlying the importance of prevention by a healthy behavior among students.

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

Introduction

In the last decades, student's physical activity (PA) levels have radically changed (1). Students are increasingly being driven to school by car or bus before walking, and participation in organized sports is declining (2).

The importance of physical activity in modern daily life is very well established, and it is now considered as medicine for a vast majority of chronic diseases (3,4). Some studies underlined that food habits, physical performance, and the level of functional capacity of human beings are interrelated (4). As such,

any dietary deficiency that adversely affects the health of the individual is likely to impair his or her physical performance capacity (5–7). Universities may have the opportunity to form healthy habits that will improve the lifestyle and health of students' future lives (8,9).

There have been several worldwide publications in recent years on food habits, but few studies covered the relationship between the physical activity and nutritional needs in adolescents, particularly for students (10,11). Clearly, there is a need for effective and better understanding of how food habits and physical activity patterns differ between athletic and non-athletic students and hence the importance of this study.

Methods

A cross-sectional survey was used on a total group of 1,346 subjects, between 19 ± 25 year old, athletic and non-athletic students, males and females from faculties from the University of Galati, Romania. (Table 1) In this cross-sectional study, it has been compared their level of PA and their food habits.

The subjects answered a self-reported anonymous questionnaire called International Physical Activity Questionnaire (IPAQ) to assess their physical activity and a self-reported anonymous diet questionnaire history questionnaire (DHQIII) to establish their food habits quantified in Healthy Eating Index score (HEI 2015). Anthropometric measurements were used in this study to calculate the body mass index (BMI) of the subjects. Within this study, 2 weeks after the initiation of the main study, a different subgroup of 246 subjects also male and female students, aged between 19 ± 25 years old were randomly selected to participate in an ancillary study with 1-day detailed food record dietary tracking, evaluated by a dietician (Table 1) before completing IPAQ and DHQIII questionnaire, self-perception of body weight, and time watching TV or PC Games. Self-perception of body weight and time watching TV or PC Games were reported elsewhere.

Anthropometric measurements

Measurement of the weight of the subjects: The weight of the subjects were measured by a weighing

machine which measures with a ± 0.1 kg sensitivity using InBody 720 (Biospace Co. Ltd, Korea).

Measurement of Body Height: The measurements of the subjects were taken by a stadiometer device (Seka 217, Germany) having the subjects with bare feet and by taking the measurements between vertex point of the head and the feet with ± 0.1 cm sensitivity. Body composition: Indices of fatness was assessed by the BMI (12,13). Descriptive data were reported as proportions (%) and mean \pm SD.

PA (Physical Activity). The students' PA was assessed based on the short version of the IPAQ questionnaire, translates into Romanian (14). The total weekly activity was expressed in metabolic equivalent task (MET) minute/week. One MET is equal to energy expenditure during rest and is approximately equal to $3.5 \text{ ml O}_2\text{kg}^{-1} \text{ min}^{-1}$ in adults. Students were classified into three main categories: Low physical activity (non-athletic Students) ($<600 \text{ MET}\cdot\text{minute}/\text{week}$), Moderate physical activity ($600\text{--}2,999 \text{ MET}\cdot\text{minute}/\text{week}$), and High physical activity (athletic students) ($>2,999 \text{ MET}\cdot\text{minute}/\text{week}$) (15).

Food habits

Food habits were assessed using the HEI 2015 score, a tool developed by the U.S. Department of Agriculture. The HEI 2015 score is a 13-component 100-point scale that assesses the adequacy and moderation components of the diet. Higher scores are associated with better dietary compliance (16). HEI 2015 score was calculated by means of self-reported DHQIII questionnaire (17).

Statistical analysis

Analyses of data were performed using SPSS 23 (SPSS Inc., USA). The level of significance $\alpha = 0.05$ was used to check the hypothesis. The difference in results was considered statistically significant when a p -value obtained was less than or equal to 0.05.

Results and Discussions

Sport activity: Median values of PA expressed in $\text{MET}\cdot\text{min}/\text{week}$, ranged from 421.86 to 5,472.87 for boys and from 384.29 to 4,506.62 for girls for the

Table 1. Demographic data of students participating in the survey.

		Main study			Ancillary study		
		Boys	Girls	Total	Boys	Girls	Total
		621 (46.1%)	725 (53.9%)	1,346	114 (46.3%)	132 (53.7%)	246
Sport activity level	Low	198 (31.88%)	247 (34.07%)	445 (33.06%)	32 (28.07%)	48 (36.36%)	80 (32.52%)
	Moderate	249 (40.10%)	312 (43.03%)	561 (41.68%)	56 (49.12%)	56 (42.43%)	112 (45.53%)
	Intense	174 (28.02%)	166 (22.90%)	340 (25.26%)	26 (22.81%)	28 (21.21%)	54 (21.29%)

main study, and from 405.66 to 5,472.87 for male students and 365.29 to 4,674.32 for female students for ancillary study.

The percentage of athletic boys involved in intense sports activities (28.02%) is higher with 5.12% than the percentage of athletic girls (22.9%) testing in the main study (Table 1). Same results are also reported by previous observations from other studies. Similar trends were found by Pinto et al. 1995 (18). In the ancillary study, 22.81% of boys and 21.21% of girls report engaging in intense sport activities.

Food habits

Median value for HEI score range from 51.3 to 54.7 for boy’s students (Fig. 1) and from 52.2 to 55.3 for girl s students surveyed in the main study (Fig. 2). In the ancillary study, HEI index range from 50.8 to 53.4 for boys and 51.24 to 54.9 for girls (Table 2).

Male athletic students had a median HEI score of 3.4 units higher than non-athletic students (Fig. 1). The Pearson correlation coefficient between the MET and HEI score values has the value $r = 0.724, p = 0.037 < 0.05$. This indicates that there is a strong positive

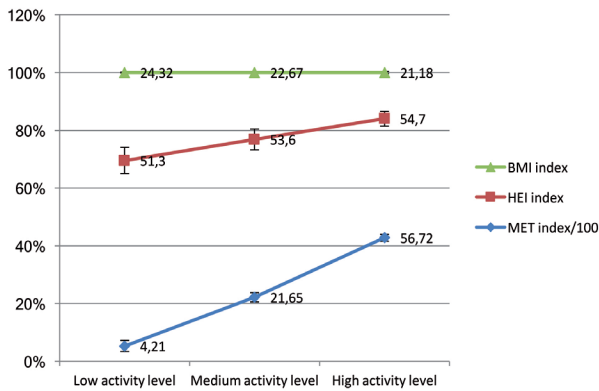


Figure 1. Comparison of BMI, HEI score, and MET for boy’s student’s participants at the main study.

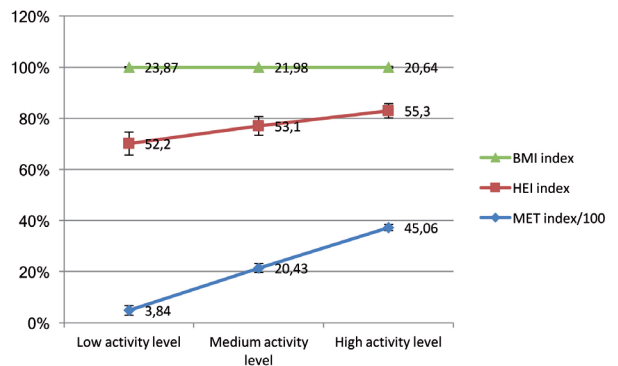


Figure 2. Comparison of BMI, HEI score, and MET for girl’s student’s participants at the main study.

Table 2. Ancillary study. MET, HEI score, and BMI index by gender and sport activity level of students.

Gender	Boys			Girls		
	Low (non-athletic students)	Medium	High (athletic students)	Low (non-athletic students)	Medium	High (athletic students)
MET, median value (SD)	405.66 (12.78)	2,215.63 (27.83)	5,472.87 (43.09)	365.29 (14.77)	2,132.68 (29.10)	5,472.87 (43.09)
HEI 2015 index, median value (SD)	50.8 (4.03)	52.5 (3.45)	53.4 (3.50)	50.8 (4.03)	52.5 (3.45)	53.4 (3.50)
BMI index, median value (SD)	25.12 (1.61)	23.42 (1.67)	22.11 (1.53)	25.12 (1.61)	23.42 (1.67)	22.11 (1.53)

correlation between the intensity of the physical activity and the increase of the HEI index which indicates a healthy diet.

The same result has reported by LaCaille et al. 2011 (19).

In the case of female students, there was the same tendency but the difference between the athletic and non-athletic female students in the case of the median value of the HEI score was only 1.1 units (Fig. 2). The Pearson correlation coefficient between the MET and HEI score values, in this case, has the value $r = 0.748$, $p = 0.028$ and it was accepted that there was a good positive correlation between the level of physical activity and food habits. Similar result has reported by Brooks-Gunn et al. (20) and Pate et al. (21).

Indices of fatness and body composition. Main study BMI index values range from 24.38 to 21.18 for boys and from 23.87 to 20.64 for girls participated in the main study. In the ancillary study, BMI index ranges from 25.12 to 22.11 for boys and from 24.55 to 20.64 for girls (Table 2).

Similar results have been reported by Johnson et al. (22) and Huang (23). A strong negative correlation between the BMI index and HEI score was observed ($r = -0.695$, $p = 0.037$). Significant negative relationships were observed between the BMI index and the IPAQ data reported for total physical activity (MET index).

We calculated the correlation coefficients between main studies and ancillary study. For physical activity (MET index), we found a very strong positive correlation $r = 0.788$, $p < 0.001 < \alpha = 0.05$.

For HEI score, main study versus ancillary study has resulted $r = 0.735$, $p < 0.001 < \alpha = 0.05$, also very strong positive correlation. For body composition (BMI index), the results obtained were in the same trend $r = 0.746$, $p < 0.001 < \alpha = 0.05$, also having a very strong positive correlation. These results validate the results obtained in the main study.

Conclusions

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. Similar results have

also been observed by Pate et al. (21), Ferron et al. (24), and Middleman et al. (25).

The existing survey underlined the coexistence of positive health characteristics and the PA associated with a good diet, suggesting that it was important to get involved in various physical activities, a fact that was a necessary component of a comprehensive prevention approach among the students surveyed. Also, the future delivery of curriculum learning of various faculties during a defined training period, with clear and easy messages reinforced to support the importance of PA and healthy food habits, especially for the students. For instance, the obtained results can underline the importance of nutrition hours in the curriculum of the faculties of physical and sports education.

Conflict of interest

The authors declare that they have no competing interests.

Authors' contributions

All authors contributed equally to this manuscript.

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