International Journal of Prevention and Treatment 2017, 6(3): 45-49
DOI: 10.5923/j.ijpt.20170603.01

Correlation between Physical Activity, Nutrition and Morphological Characteristics of Student Population

Šeper Vesna*, Nešić Nebojša, Davidović-Cvetko Erna

College of Applied Sciences, Lavoslav Ružička Vukovar, Croatia

Abstract The aim of this research was to identify whether there is correlation between nutrition, physical activity and morphological characteristics of student population. Physiotherapy final year students, 27 females and 13 males, age 20.6±1.3 participated. They were asked to complete two questionnaires: on frequency of eating bread, pastry, milk, fruit, vegetables, meat and fish for past 6 months and short International Physical Activity Questionnaire (IPAQ) Croatian version for past seven days. We measured height, weight, upper and lower extremities circumference, waist and hip circumference and calculated body mass index, percent body fat, lean body mass and waist to hip ratio. Results showed significant difference in consumption of integral bread ($p=0.048$) and fish ($p=0.041$) among sexes, but no correlation between morphological characteristics and nutrition ($p>0.05$). There is no significant sex difference regarding physical activity (PA), except in category vigorous PA ($p<0.05$). Correlation between PA and morphological characteristics exists for females and males ($p<0.05$). To conclude, it appears that morphologic characteristics show no correlation with nutrition but do with physical activity in both sexes although women are less active than men.

Keywords Nutrition, Physical activity, Morpholgic characteristics, Students

1. Introduction

Physical activity and balanced nutrition are two main components of good health and longelivity. World Health Organisation gave recommendations on physical activity but 70% of people in developed countries do not meet those recommendations (Ostojic, Stojanovic & Milosevic, 2013) and it is estimated that by the end of 2020 noncommunicable diseases will be the cause of 73% of all deaths in the world (Rao et al, 2012). The number of overweight people also increased (Hills, Dengel & Lubans, 2012; Huijig et al 2015), as well as the number of adults and children with cardiovascular and metabolic diseases (Ostojic et al, 2011). Students are particularly at risk because during university years physical activity decreases, weight is gained and eating habits change (Shah, Amirabdollahian & Costa, 2011). Research on physical activity and nutrition of students show that they do not participate regularly in physical activity, and if they do it is usually not enough to benefit health, they eat unhealthful food usually when stressed or bored, late at night or in relation to drinking alcohol (Keating et al, 2005; Nelson et al, 2009; Bhochhibhoya et al, 2014). Data also show increase in consumption of meat, eggs and dairy products and decrease in legumens, friuts and vegetables (Westhoek et al, 2014). Dietary habits of student population usually include sweets, snacks, soft drinks and pastries (Moreno et al, 2012). Their diet and physical activity behaviors are influenced by enrolling on a college and forming new social networks (Harmon et al, 2016), as well as leaving home and creating some new permanent habits (Young, Sturts & Ross, 2015). Knowing this, a question about physical activity and nutrition of students in Vukovar emerged. We wanted to know are they physically active, what kind of food do they choose and how it correlates with their morphological characteristics, since they are physiotherapy students, future educators on healthy way of life.

* Corresponding author:
vesna.seper@vevu.hr (Šeper Vesna)
Published online at http://journal.sapub.org/ijpt

2. Methods

2.1. Subject Sample

Physiotherapy final year students, 27 females and 13 males, age 20.6±1.3 participated in the research. They were randomly selected. Mean values for body mass index (BMI), lean body mass (LBM), percent body fat (PBF), waist to hip ratio (WHR), weight and height are shown in table 1. Research took place at College "Lavoslav Ružička" in Vukovar during 2015.

2.2. Ouestionnaires

Students were asked to complete a questionnaire on frequency of vegetables, fruit, dairy products, eggs, meat,

fish, bread and pastry, grains, drinks, fried food and salt consumption 6 months prior to the research. They had to choose the answer best fitting the frequency of consumption where zero (0) stood for less than one time per week, one (1) – one time per week, two (2) – two to four times per week, three (3) – almost every day, four (4) – two or more times per day). Physical activity was estimated using short IPAQ questionnaire Croatian version. This questionnaire asseses physical activity as a part of every day living. Examinees had to estimate how much time did they spend during the day or week, one week prior to research, doing vigorus or moderate physical activity, how long did they walk, or sit. All the answers regarding physical activity less than 10 minutes were not taken into consideration. Results were calculated in MET minutes. Because of the assumption that a person sleeps 8 hours at night results such as 960 MET minutes of daily activities were expeled. Answers about physical activity like Don't know, Not sure or Didn't do this type of PA were marked as 0.

2.3. Measurements

We measured weight, hight and body circumferences (forearm, arm, leg, waist and hip). The room where the measurements took place was 24°C, air conditioned, and students wore shorts and sleeveless T-shirts. Day before the measurements they engaged in no physical acitivity. They were divided into two groups, and two persons did the measurements, one physiotherapist and one student who noted the results. One group had 17 students and they were measured from 8am until 10am, and the other group had 23 students and they were measured from 1pm until 3pm. They were divided in two groups due to classes schedule. Weight and height were measured using Seca scale, type 700, class III, maximum weight 200kg, minimum weight 1kg with 0.1kg sections and maximum height 200cm with 0.1cm sections. Upper arm, forearm, thigh and shin, waist and hip circumference were measured using measuring tape, maximum lenght 150cm with 0.1cm sections. Before the measurements all the orientation marks on the body were highlighted using a pen. Upper arm circumference was measured on both arms relaxed at side 10cm below acromion in standing position. Forearm circumference was measured in the same way but 10cm below olecranon process. As for the thigh circumference it was also measured in standing position 10 cm below greater trochanter and for the shin circumference over the widest part of it. Waist circumference was measured over the navel and hip circumference over the widest part of both hips. Based on the aquired measures body mass index (BMI), waist to hip ratio (WHR), percent body fat (PBF) and lean body mass (LBM) were calculated. BMI was calculated as weight in kilogrammes divided by height square in metres; WHR as waist circumference divided by hip circumference in centimetres; PBF according to formula by McArdle at al (1981) for females using age, waist circumference + right tigh circumference + right shin cirumference and for males using age, right upper arm circumference + waist circumference + right shin circumference. LBM was calculated using Hume formula (1966) for males 0.3281 x weight in kg + 0.33929 x height in cm – 29.5336 and for females 0.29569 x weight in kg + 0.41813 x height in cm - 43.2933.

2.4. Statistical Analysis

Statistical program MedCalc 10.2.0.0 was used for analysis. Chi square was used to determine differences in frequency of food consumption among sexes ($P<0.05$). Cluster analysis using Ward's method was applied to group examinees according to the similiarity of answers regarding frequency of food consumption, and Two-way Anova was used to determine differences between morphologic characteristic of groups based on two factors: food and sex ($P<0.001$). Mann-Whitney test was used to establish differences in physical activity among sexes ($P<0.05$). Correlation between physical activity and morphologic characteristic was estimated with Pearson's coefficient ($P<0.05$).

3. Results

Physiotherapy students participated in this research more women (27) than men (13), age 20.6±1.3. Men were taller and heavier than women with higher BMI, LBM and WHR values (table 1.).

Table 1. Mean values of anthropometric measures for men (13) and women (27)

Measure	Males	Females
Weight (kg)	81.7±10.6	61.6±9.8
Height (cm)	181.2±6.5	167±6.2
BMI (kg/m²)	25±3	22.3±3
LBM (kg)	63.4±5.6	45.4±5
PBF (%)	19±3.8	12.8±3.6
WHR	0.8±0.04	0.74±0.02

Students were divided into clusters, based on their answers, to determine if correlation between nutrition, morphologic characteristics and sex existed. No correlation was found with nutrition ($p>0.05$) but did with sex ($P<0.001$). When we analysed nutrition questionnaire only significant difference found between males and females was regarding the frequency of integral bread, grains ($p=0.048$) and fish consumption ($p=0.041$). Eventhough there were no significant differences between men and women regarding frequency of white bread ($p=0.80$) and cake consumption ($p=0.28$) bread is eaten daily, but muffins, doughnuts and cakes only once a week. Students (40%) reported eating fat milk, butter and hard cheese once a day and margarine (55%) less than once a week. As for the friut they usually eat apples (37.5%) and regarding vegetables lettuce, tomatoes or peas (50%) two or more times a week. No significant differences were found between men and women ($p>0.05$). We also

found that 60% of all students eat white meat more often than the red meat. Sausages, salami, hot-dog and bacon half of them reported eating less than once a week. Almost half of them also reported eating eggs every day. Many (45%) declared eating fried food very often, but they do not drink cola beverages, or sodas so often. Women (96%) wanted to change their nutrition significantly more (p=0.0043) than men, who were satisfied with the food they eat. Almost all (83%) believed in succesfull change of their nutrition (p=0.49).

When we analysed IPAQ questionnaire we found no significant sex differences regarding physical activity except in category vigorous PA (p<0.05) (table 5.). As for the influence of PA on morphologic characteristic significant correlation was found for walking daily and weekly with weight (p=0.036; p=0.024), LBM (p=0.013; p=0.009), PBF (p=0.009; p=0.008), WHR (p=0.023; p=0.014) for women and vigorous PA and LBM for men (p=0.019; p=0.024).

Table 2. Physical activity in MET minutes – sex differences (*p=0.034; **p=0.030)

Physical activity/ MET/min	Males	Females
walking daily	90	60
walking weekly	560	300
moderate PA daily	66.75	0
moderate PA weekly	66.75	0
vigorous PA daily	360*	0
vigorous PA weekly	720**	0

4. Discussion

This research found that morphological characteristcs of students correlate with physical activity and with sex, but not with nutrition. Vigorous PA correlates with LBM in men whereas walking correlates with weight, WHR, PBF and LBM in women. There were no significant differences between men and women regarding physical activity except in category vigorous PA. Those changes may be due to the fact that PA was estimated, not measured or contributed to hormones (Cook & Schoeller, 2011) and sex (Larson-Meyer et al, 2012). Hallal et al (2012) and Varela-Mato et al (2012) also found that men are more active than women since men find physical activity more important in weight menagement and health maintenance than women (Elinder, Sundblom & Rosendahl, 2011). Of course, initial results also showed that men were taller and heavier than and women with higher values of BMI and LBM and lower values of PBF than women similar to research by Geer & Shen (2009) and Lakoski et al (2011) on sex differences, body fat and body mass index, who reported that college men tend to have higher LBM and women PBF. This also may be due to hormones, especially testosteron (Plaisance et al, 2009), or age (Taylor et al, 2010) as morphological differences tend to be more obvious with age. Regarding the fact that walking correlates with changes in weight, WHR, PBF and LBM in women is important as it can be a good intervention strategy in prevention metabolic disorders in older age. Some of the experimetal research state that decreasing time spent sitting or standing is better than adding vigorous PA into daily routine (Hamilton, Hamilton & Zderic, 2007). Besides PA nutrition is also important factor in metabolic disorders prevention, especially since we adopt eating habits very soon and it is difficult to change them. No correlation was found between morphological characteristics of students and nutrition in this research. Men and women significantly differ only in frequency of intergral bread, grains and fish consumption. We contributed this to the fact that students completed a questionnaire on frequency of groceries consumption, because there is only one student restaurant in Vukovar and to the influence of region on food choice (El Ansari, Suominen & Samara, 2015; Baldini et al, 2009). For example, Mediterranean diet suggests eating fish and white meat, integral bread, vegetables, fruit as dessert and avoiding margarine (Papadaki et al, 2007) as do Vukovar students. Or, compared to American students who eat a lot of fried food and drink aerated beverages (Racette et al, 2005; Ko, 2007), students from Vukovar eat fried food often also but drink less cola beverages. We also think that the ability to make own decisions regarding food, and eating with friends impact food choices students make (Huang et al, 1994; Sukalakamala & Brittin, 2006).

5. Conclusions

Nutrition has no impact on morphological characteristic of students in this research, and there aren't so many differences between men and women regarding food choices they make. However, physical activity showed correlation with morphological characteristics, especially walking for women, eventhough men reported beeing significantly more active. This could be used in future when planning training programmes for women and men aiming to prevent metabolic disorders or cardiovascular diseases. For more sheered results all students should be included and PA and nutrition sholud be objectively measured.

REFERENCES

[1] Baldini, M., Pasqui, F., Bordoni, A., & Maranesi, M. (2009). Is the Mediterranean lifestyle still a reality? Evaluation of food consumption and energy expenditure in Italian and Spanish university students. *Public health nutrition*, *12*(02), 148-155.

[2] Bhochhibhoya A, Branscum P, Taylor L, Hofford, C. (2014). Exploring the Relationships of Physical Activity, Emotional Intelligence, and Mental Health among College Students. *American Journal of Health Studies*, 29(2), 191-197.

[3] Cook, C. M., & Schoeller, D. A. (2011). Physical activity and weight control: conflicting findings. *Current Opinion in Clinical Nutrition & Metabolic Care*, *14*(5), 419-424.

[4] El Ansari, W., Suominen, S., & Samara, A. (2015). Eating Habits and Dietary Intake: Is Adherence to Dietary Guidelines Associated with Importance of Healthy Eating among Undergraduate University Students in Finland?. *Central European journal of public health*, *23*(4), 306.

[5] Elinder, L. S., Sundblom, E., & Rosendahl, K. I. (2011). Low physical activity is a predictor of thinness and low self-rated health: gender differences in a Swedish cohort. *Journal of Adolescent Health*, *48*(5), 481-486.

[6] Geer, E. B., & Shen, W. (2009). Gender differences in insulin resistance, body composition, and energy balance. *Gender medicine*, *6*, 60-75.

[7] Hallal, P. C., Andersen, L. B., Bull, F. C., Guthold, R., Haskell, W., Ekelund, U., & Lancet Physical Activity Series Working Group. (2012). Global physical activity levels: surveillance progress, pitfalls, and prospects. *The lancet*, *380*(9838), 247-257.

[8] Hamilton, M. T., Hamilton, D. G., & Zderic, T. W. (2007). Role of low energy expenditure and sitting in obesity, metabolic syndrome, type 2 diabetes, and cardiovascular disease. Diabetes, 56(11), 2655-2667.

[9] Harmon, B. E., Forthofer, M., Bantum, E. O., & Nigg, C. R. (2016). Perceived influence and college students' diet and physical activity behaviors: an examination of ego-centric social networks. *BMC public health*, *16*(1), 473.

[10] Hills, A. P., Dengel, D. R., & Lubans, D. R. (2015). Supporting public health priorities: recommendations for physical education and physical activity promotion in schools. *Progress in cardiovascular diseases*, *57*(4), 368-374.

[11] Huang, Y. L., Song, W. O., Schemmel, R. A., & Hoerr, S. M. (1994). What do college students eat? Food selection and meal pattern. *Nutrition Research*, *14*(8), 1143-1153.

[12] Huijg, J. M., Gebhardt, W. A., Verheijden, M. W., van der Zouwe, N., de Vries, J. D., Middelkoop, B. J., & Crone, M. R. (2015). Factors influencing primary health care professionals' physical activity promotion behaviors: a systematic review. *International journal of behavioral medicine*, *22*(1), 32-50.

[13] Hume, R. (1966). Prediction of lean body mass from height and weight. *Journal of clinical pathology*, *19*(4), 389-391.

[14] Keating, X. D., Guan, J., Piñero, J. C., & Bridges, D. M. (2005). A meta-analysis of college students' physical activity behaviors. *Journal of American college health*, *54*(2), 116-126.

[15] Ko, M. S. (2007). The comparison in daily intake of nutrients, dietary habits and body composition of female college students by body mass index. *Nutrition research and practice*, *1*(2), 131-142.

[16] Lakoski, S. G., Barlow, C. E., Farrell, S. W., Berry, J. D., Morrow, J. R., & Haskell, W. L. (2011). Impact of body mass index, physical activity, and other clinical factors on cardiorespiratory fitness (from the Cooper Center longitudinal study). *The American journal of cardiology*, *108*(1), 34-39.

[17] Larson-Meyer, D. E., Palm, S., Bansal, A., Austin, K. J., Hart, A. M., & Alexander, B. M. (2012). Influence of running and walking on hormonal regulators of appetite in women. *Journal of obesity*, *2012*.

[18] McArdle, W. D., Katch, F. I., & Katch, V. L. (2010). *Exercise physiology: nutrition, energy, and human performance*. Lippincott Williams & Wilkins.

[19] Moreno-Gómez, C., Romaguera-Bosch, D., Tauler-Riera, P., Bennasar-Veny, M., Pericas-Beltran, J., Martinez-Andreu, S., & Aguilo-Pons, A. (2012). Clustering of lifestyle factors in Spanish university students: the relationship between smoking, alcohol consumption, physical activity and diet quality. *Public health nutrition*, *15*(11), 2131-2139.

[20] Nelson, M. C., Kocos, R., Lytle, L. A., & Perry, C. L. (2009). Understanding the perceived determinants of weight-related behaviors in late adolescence: a qualitative analysis among college youth. *Journal of nutrition education and behavior*, *41*(4), 287-292.

[21] Ostojic, S. M., Stojanovic, M. D., Stojanovic, V., Maric, J., & Njaradi, N. (2011). Correlation between fitness and fatness in 6-14-year old Serbian school children. *Journal of Health, Population and Nutrition*, 53-60.

[22] Ostojić S. M., Stojanović, M. D., Milošević, Z. (2013) Fizička (ne)aktivnost – definicija, učestalost i ekonomski aspekti. *Časopis za Društvene Nauke.*

[23] Papadaki, A., Hondros, G., Scott, J. A., & Kapsokefalou, M. (2007). Eating habits of university students living at, or away from home in Greece. *Appetite*, *49*(1), 169-176.

[24] Plaisance, E. P., Grandjean, P. W., Judd, R. L., Jones, K. W., & Taylor, J. K. (2009). The influence of sex, body composition, and nonesterified fatty acids on serum adipokine concentrations. *Metabolism*, *58*(11), 1557-1563.

[25] Racette, S. B., Deusinger, S. S., Strube, M. J., Highstein, G. R., & Deusinger, R. H. (2005). Weight changes, exercise, and dietary patterns during freshman and sophomore years of college. *Journal of American college health*, *53*(6), 245-251.

[26] Rao, C., Darshan, B. B., Das, N., Rajan, V., Bhogun, M., & Gupta, A. (2012). Practice of physical activity among future doctors: A cross sectional analysis. *International journal of preventive medicine*, *3*(5).

[27] Shah, N., Amirabdollahian, F., & Costa, R. (2011). The dietary and physical activity habits of university students on health and non‐health related courses. *Journal of Human Nutrition and Dietetics*, *24*(3), 303-304.

[28] Sukalakamala, S., & Brittin, H. C. (2006). Food practices, changes, preferences, and acculturation of Thais in the United States. *Journal of the American Dietetic Association*, *106*(1), 103-108.

[29] Taylor, R. W., Grant, A. M., Williams, S. M., & Goulding, A. (2010). Sex Differences in Regional Body Fat Distribution From Pre‐to Postpuberty. *Obesity*, *18*(7), 1410-1416.

[30] Varela-Mato, V., Cancela, J. M., Ayan, C., Martín, V., & Molina, A. (2012). Lifestyle and health among Spanish university students: differences by gender and academic discipline. *International journal of environmental research and public health*, *9*(8), 2728-2741.

[31] Westhoek, H., Lesschen, J. P., Rood, T., Wagner, S., De Marco, A., Murphy-Bokern, D., Leipf, A., van Grinsvena, H., Sutton, M. A., & Oenema, O. (2014). Food choices, health and environment: effects of cutting Europe's meat and dairy intake. *Global Environmental Change*, *26*, 196-205.

[32] Young, S. J., Sturts, J. R., & Ross, C. M. (2015). Physical activity among community college students. *Physical Educator*, *72*(4), 640.