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LIFESTYLE IN THE CONTEXT OF SOMATIC DIAGNOSTICS FOR FUTURE EDUCATORS

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Abstract

Applied health literacy at the level of dietary and physical activity habits acquired during university studies relates to weight control and is one of the important prerequisites for a healthy lifestyle. Future educators will be able to pass on the acquired health literacy during their studies at university to children, pupils and students. Evaluate health literacy with an emphasis on dietary and physical activity habits in the context of body mass categorisation based on the Body Mass Index and body composition assessment. Research group consisted of students of pedagogical disciplines at the Pedagogical Faculty of Palacký University in Olomouc. We differentiated the monitored group into sub-groups according to Body Mass Index categorisation. Bioelectric impedance method was used to evaluate body composition using InBody 720 analyser. Physical activity was monitored by ActiGraph GT1M accelerometer and data on dietary habits were acquired by questionnaire survey. Received energy supplied in five portions per day and meeting the recommended volume and intensity of physical activity has the optimum effect on the state of body composition (body fat, visceral fat, fat free mass). With higher BMI (overweight, obesity), the amount and intensity of physical activity is reduced and so is the number of food portions per day. Our research study demonstrated the relationship between normal weight category (BMI_normal) and dietary and exercise habits. Pedagogical disciplines are involved in shaping the level of health literacy of pupils; it is also essential to develop the practical level of their acquired knowledge in this area.

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Keywords: Health education, students of pedagogical disciplines, physical activity, dietary habits, body composition.

1. Introduction

Nutrition and physical activity are two key lifestyle components that are affected by our actions. The need to form and develop health literacy systematically in the educational process is based on research that maps the behaviour of children and adolescents in the area of health and lifestyle. Health literacy in the Czech Republic is assessed as problematic to low among the adult population. Opening for forming health literacy, health promotion and health education is thus created at the individual levels of the education system, where within the curriculum documents this issue is instigated into goals and educational contents (Fleary, Patrece, & Pappagianopoulos, 2018; Nutbeam, 2008; Van der Heide, Wang, Droomers, Spreeuwenberg, Rademakers, & Uiters, 2013).

King, Hopkins, Caudwell, Stubbs and Blundell (2009) state that healthy lifestyle is carried out by an individual who takes regular exercise at least 2.5 hours per week, eats diet rich in fruit and vegetables in five pieces, maintains optimal body weight (Body Mass Index 18.5 to 24.9 kg/m^2), occasionally (or not) drinks alcohol and does not smoke. The individual should lead his/her lifestyle to have a positive effect on his/her health. It is a focused process leading to the harmonisation of all activities in relation to the person's individual options and needs.

Regular intake of food during the day maintains increased metabolic turnover, prevents fat deposits in the body and is an independent predictor of appropriate weight. In addition to the correct amount of energy received, it is essential to distribute it into five meals per day (Ma, 2003; Rokyta, 2000). Based on the recommendations given in the "Nutritional Recommendations for the Population of the Czech Republic" (2012) document it was concluded that five portions is the optimal distribution of meals during the day and consuming four or less portions a day is deemed as non-optimal diet.

The basic indicator that determines the effect of physical activity on maintaining body weight is the level of physical activity. It is governed by the intensity and duration of the given physical activity and frequency of exercise units. The recommendations of the American Sports Medicine Association indicate that moderate-intensity aerobic exercises (such as walking fast; 3-6 METs), at least 30 minutes five days a week, are considered for individuals who wish to maintain good health as an optimal aerobic exercise (U. S. Department of Health and Human Services, 2008). Saris et al., (2003) recommends at least 10 000 steps/day to retain the desired weight. Walking is the physical activity that is most commonly carried out during the day and is also recommended as a basic form of physical activity.

Based on the results of extensive US population studies conducted primarily through NHANES II in 1985, it was recommended that Body Mass Index (BMI) is used to determine the optimal body mass (Block, Dresser, Hartman, & Carroll, 1985). To make it easier, the current classification does not take into account physiological gender and age differences. The current definition of obesity is inadequate; the obesity threshold is given by BMI $\geq$ 30.0 kg/m^2 (WHO, 2004).

Facts relating to the human body composition are the prerequisite for understanding its functioning in health and sickness. The optimal body composition is considered as an appropriate indicator of the current state of health. The body composition is influenced genetically; furthermore it is formed by exogenous factors, which include physical activity, dietary habits and general health of the organism (Baumgartner, 2000; Sofková & Přidalová, 2015).

2. Problem Statement

The rationale for educating future teachers of different approbation combinations to gain health competence and thus ensuring the development of health literacy is based on a series of research studies confirming the relationship between the health literacy level and education level and consequently socio-economic status (Van der Heide, Wang, Droomers, Spreeuwenberg, Rademakers, & Uiters, 2013).

Lifestyle is the outcome of human-environs interaction. Appropriate dietary habits and sufficient physical activity play a part in weight control and are one of the key prerequisites for a healthy lifestyle. Fixed positive principles in these areas, particularly sufficient physical activity and appropriate energy intake, are the best, safest and economically the least demanding preventive means of non-infectious diseases (Saelens & Anderson, 2003; Katzmarzyk et al., 2008).

The advantage of BMI lies in its simplicity and its use in wide-ranging epidemiological research. Nevertheless, many authors do not consider the assessment by using BMI categorisation of body mass as satisfactory (Gába & Přidalová, 2014; Kyle, Morabia, Schutz, & Pichard, 2004; Romero-Corral et al., 2008). In some age categories, the BMI diagnostic evidence is very low. BMI does not capture representation of individual body components, particularly the representation of body fat, visceral fat and fat free mass.

We consider the body composition to be a suitable indicator of the functional status of the organism and it reflects lifestyle. In recent times, there is a growing interest in information about the body composition, specifically in connection with the increase in the number of overweight and obese individuals.

3. Research Questions

The primary research objective was to evaluate health literacy with an emphasis on dietary and physical exercise habits within the context of the Body Mass Index categorisation and to assess the individual body components of female students of the Faculty of Education of the Palacký University in Olomouc.

- Evaluate dietary habits based on the daily frequency of meals within the context of BMI categorisation.
- Assess the level and intensity of physical activity within the context of BMI categorisation.
- Evaluate selected body composition parameters, particularly body fat, visceral fat and fat free mass based on BMI categorisation.

4. Purpose of the Study

Given the fact that primary prevention is always the most effective, the focus of this study was on future teachers and their health literacy at the level of dietary and physical exercise habits. Future educators will be able to pass onto the children, pupils and students health literacy acquired during their university studies.

Every year number of people at risk of overweight and obesity is increasing and thus it is essential to look for ways that will enable people to comply with the basic recommendations on healthy lifestyle

using natural approach. Projects related to health promotion and health education are one of the suitable ways.

Good health literacy based on optimal categorisation of body weight and body components may be a tangible basis in motivating future teachers to apply lifestyle-related preventive measures. Expressing physical activity by means of an accelerometer is, after assessment, a good orientation tool and motivational element and is also used as influential cognisance of the level and intensity of physical activity carried out.

5. Research Methods

5.1. Research group

The target group were female students, within the age range of 18–30 years, of the Pedagogical Faculty of Palacký University in Olomouc. Students were divided into two groups according to the Body Mass Index categorisation (BMI_N – normal mass: 18.5 to 24.9 kg/m^2; BMI_O – overweight and obesity: ≥ 25.0 kg/m^2). The research included somatic examination, questionnaire survey relating to dietary habits and monitoring physical activity.

5.2. Somatic examination

InBody 720 analyser was used to diagnose body composition by the direct-controlled multi-frequency bioelectric impedance (1–1000 kHz). Body Mass Index ($BMI = BM/BH^2$, kg/m^2) was determined on the basis of anthropometric parameters, namely body mass (BM, kg) and body height (BH, m).

5.3. Questionnaire survey relating to dietary habits

Data relating to dietary habits were acquired by questionnaire survey focused on the frequency of consumption of meals during the day (breakfast, morning snack, lunch, afternoon snack, dinner).

5.4. Monitoring physical activity

ActiGraph GT1M accelerometer was used for monitoring the level and intensity of physical activity during the week and the average daily number of steps. Data were recorded in the Record Sheet.

5.5. Data analysis

Data acquired by InBody 720 analyser was processed using Lookin'Body 3.0 program; data relating to the dietary and physical exercise habits were transferred to MS Excel spreadsheet. Statistical data analysis was carried out with the use of Statistica 10.0 program (StatSoft). Key statistical quantities for the monitored parameters and their differences between the BMI categories were calculated. The significance of these differences was tested using the Mann-Whitney U test. Statistical significance was determined at $\alpha < 0.05$ level.

6.   Findings

In the BMI_N category, 80.7% of female students regularly eat breakfast and 76.0% in the BMI_O category. During nocturnal fasting reduction in resting energy expenditure takes place, which is raised by timely breakfast. In order for the breakfast to achieve its stimulating effect on metabolism, its appropriate timing should be within half an hour of awakening. According to the reports, 24.3% in BMI_N category and 22.3 % in BMI_O category eat breakfast within this time. The morning snack is regularly consumed by 92.9% of female students in the BMI_N category and 85.5% in the BMI_O category. 67.7% in the BMI_N category and 59.2% in the BMI_O category from the monitored group regularly eat lunch. Approximately half of the daily energy intake should be taken during the first half of the day. The afternoon snack should follow 3-4 hours after the lunch. Up to 98% of female students in both categories regularly snack in the afternoon. The afternoon snack can perhaps replace the lunch that some students skip. In general, it is recommended to have a preference for lower energy and lower glycaemic index foods in the afternoon. Evening meal should be low in energy value but high in quantity. Dinner should suitably complement the daily dietary regime. Usually, female students have a dinner (BMI_N: 74.6 %; BMI_O: 72.3 %). Based on the low frequency of skipping meals, we evaluate the eating habits positively.

Based on the recommended categorisation of the daily number of steps according to Tudor-Locke and Bassett (2004), we may state that the recommended number of 10 000 steps per day (HPA) was not carried out by any of the monitored groups. The first group of female students in the BMI_N category may be classified as optimally active individuals (BMI_N: 7 565 steps/day). A group of female students with BMI in overweight and obesity category (BMI_O: 6 640 steps/day) fall into the category of individuals with typical daily activity. The statistical analysis of the daily number of steps carried out did not reveal any statistical significance among the results.

Whitt, Kumanyika, and Bellamy (2003) confirm that women with BMI < 25 carry out higher physical activity with the highest number of steps per day than women in overweight and obesity category. Wyatt, Peters, Reed, Barry, and Hill (2005) proved that obese individuals (BMI > 30) carry out 2 000 steps a day less than individuals with normal body weight. The results acquired by Tudor-Locke and Myers (2001) indicate that the number that is circa greater than 9 000 steps/day is beneficial for the body composition and the number of steps less than 5 000 per day indicate a sedentary lifestyle associated with unhealthy body composition.

Based on the WHO recommendations (2004) for an adult, we may conclude that the average values of moderate physical activity (PAs) in the study group follow general recommendations relating to the intensity of 3-6 METs of at least 150 min/week (BMI_N: 213.5 min/week; BMI_O: 178.9 min/week). There was no statistical significance of the monitored parameter among the individual BMI categories.

Table 1 presents selected somatic characteristics for individual groups differentiated by BMI categorisation. Looking at the BMI categories, it can be seen that the average body fat percentage (BFP) values correspond to the normal weight category (BMI_N: 25.9%). Average body fat values for female students in BMI overweight and obesity category (BMI_O: 39.9%) fall into the obesity category Heyward & Wagner, 2004). For visceral fat (VFA), the values exceed the recommended standard (> 100 cm²) in the BMI_O category (BMI_N: 42.9 cm²; BMI_O: 112.2 cm²) with the moderate risk being between 100-150 cm^2 and the high risk above 150 cm^2. Higher levels of visceral fat determine abdominal obesity, which is

one of the key assessment criteria for metabolic syndrome and has almost comparable predictive value for severe cardiovascular events as elevated level of LDL cholesterol. The proportion of total body water (TBW) in the BMI_O category (43.8%) did not exceed 50% limit. The differences between the BMI categories for selected body composition parameters were significant.

Table 01. Selected somatic characteristics in relation to the Body Mass Index

Variable	BMI_N Mean $\pm$ SD	BMI_O Mean $\pm$ SD	p_N-O
FFM (kg)	43.7 $\pm$ 4.5	50.3 $\pm$ 5.2	< 0,001
BFM (kg)	15.5 $\pm$ 4.2	34.5 $\pm$ 6.3	< 0,001
BFM (%)	25.9 $\pm$ 5.4	39.9 $\pm$ 4.1	< 0,001
VFA (cm^2)	42.9 $\pm$ 15.5	112.2 $\pm$ 22.1	< 0,001
TBW (%)	54.2 $\pm$ 4.0	43.8 $\pm$ 2.9	< 0,001

Note: FFM – fat-free mass, BFM – body fat mass, VFA – visceral fat area, TBW – total body water.

7. Conclusion

The differences between the BMI categories for individual meals during the day were statistically insignificant for the group we investigated. Of the total number of female students monitored, 3/4 students regularly eat breakfast and dinner. The morning snack is regularly consumed by 92.9% of students in the BMI_N category and 85.5% of students in the BMI_O category. 67.7% in the BMI_N category and 59.2% in the BMI_O category eat lunch regularly. Up to 98% of students in both categories regularly have the afternoon snack. The afternoon snack can probably replace the lunch. In relation to similar frequency of daily meals in both BMI categories, individual portions consumed by BMI_O students with their size and caloric intake may exceed the recommended amount of food.

In connection with the assessment of intensity and level of physical activity, the research group consisted of physically active female students. When assessing the average values of intensity and level of physical activity, it was clear that both of these indicators decreased with increasing BMI. The monitored BMI categories met the general recommendations related to the physical activity of moderate intensity. In terms of assessing habitual physical activity, it may be stated that female students in the BMI_N group can be considered as optimally active individuals. Analysis of selected indicators of physical activity showed that students with lower BMI (BMI_N) are more physically active compared to students with higher BMI (BMI_O).

The recommended standards of average values of somatic characteristics were confirmed in the category of female students with normal weight (BMI_N). In the BMI_O category, higher significant average values were confirmed for selected characteristics related to the risk aspects of overweight and obesity (BFM: body fat, VFA: visceral fat). The average VFA value in BMI_O group signalled a moderate risk of cardiovascular disease and changes in the lipid spectrum. In addition, lower average body water and fat free mass was found.

Positive results of health literacy based on good dietary and physical activity habits can be a motivation to maintain preventive measures leading to a healthy lifestyle. We evaluate positively the state of health literacy in relation to the dietary and physical activity habits in groups of female students. Due to the fact that pedagogical disciplines are involved in shaping the level of health literacy in pupils, the results

of our research will be used within the academic educational reality in disciplines related to the health literacy and health education.

Acknowledgments

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