Original Paper

Biomedical Human Kinetics, 4, 12 – 17, 2012

DOI: 10.2478/v10101-012-0003-3

Health awareness, motor performance and physical activity of female university students

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Summary

Study aim: To assess body composition, health awareness and cardiorespiratory fitness in female university students differing in volume of obligatory physical activity classes.
Material and methods: 109 female students of the University of West Hungary volunteered to participate in the study. The subjects were divided into two groups according to frequency and volume of obligatory physical activity: students of recreation and health education programmes (RHE; n = 27) and of social pedagogy, tourism and catering, and teacher training programmes (STT; n = 82). Basic somatic characteristics were measured, body composition was assessed by bioelectrical impedance, cardiorespiratory fitness was evaluated using the Rockport Fitness Walking Test and health behaviour was assessed by questionnaire method. Student's t-test for independent samples, the U Mann Whitney test or chi-square test were used in data analysis.
Results: RHE students had higher values of percentage muscle mass ($p<0.05$) and of cardiorespiratory performance ($p<0.001$), they also declared significantly more frequently ($p<0.001$) practicing leisure physical activity as compared with the STT group. However, in both groups the symptoms of unhealthy behaviour were observed.
Conclusions: Although beneficial effects of augmented physical activity on body composition, cardiorespiratory performance and attitudes towards taking up leisure-time activity was noted, attention should be paid to symptoms of unhealthy behaviour observed in female students. This support the need for including obligatory physical education classes in university curriculum and the importance of education and promotion of healthy behaviour among the students.

Key words: Health behaviour – Body composition – Motor performance – Female students

Introduction

Hungary has experienced remarkable change in its political system, general socioeconomic conditions and its physical environment over the past 30 years. As a consequence of such change the social expectations of women have also significantly increased in this period and studies of women's health issues and health behaviour are of constant interest [18,26]. Inevitably any positive changes this period brought about were also accompanied by negative aspects, namely a remarkable general decrease in people's habitual physical activity and changes in nutritional habits. The negative characteristics of this transitional period in Hungary can be found to a considerable extent in students of higher education. According to some human biologists many factors of environmental influence are difficult to specify or have less overall importance. Among these environmental factors however, definite emphasis and importance can be attributed to nutrition and regular physical exercise [4,6].

There is evidence that a certain level of physical fitness is a vital part of being healthy, yet a physically active lifestyle has real value when combined with healthy daily habits as well. The behaviour patterns which have a negative influence on health usually include stress, diet, drug abuse, alcohol consumption, smoking, medication and lack of sleep. It is the role and indeed responsibility of the educational system to raise awareness of health issues and educate children about a healthy way of life from an early age. Nowadays most curricula contain some sort of theoretical and practical knowledge of healthy active living [27].

Probably the most determinative segment of a healthy lifestyle in a student's life is the one in which education is carried out within an organised framework. The behavioural pattern mediated by the teacher (especially in the field of physical education) is a key factor. The lack of a healthy behavioural pattern or negative models harmfully influence the attitude and regular activity level of children and young adults [3]. The desired behavioural

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patterns can be developed only as a result of a long process for which society (on the macro level), and different educational spheres (family, school, friends, sport clubs, etc.), at the micro level, have a great responsibility [29]. The motivated, mentally and physically well-trained educator will be able to develop and devolve a constructive lifestyle pattern that involves tasks of prevention as well. It is believed that behavioural patterns learned and formed in educational institutes remain a part of us our whole life. If proper bases are built during youth, then one can build on them throughout higher education studies as well.

It is during late adolescence and young adulthood when most negative behaviour patterns become a regular habit of the individual [14]. It is known that the more people smoke, the worse their physical performance become lesser to a significant degree [8].

Regular physical activity, besides its general favourable effects, can be used in rehabilitation and for the prevention and treatment of certain illnesses [15,16,21,24,29], and has also been shown to decrease the harmfulness of overweight conditions and obesity [5]. Physically-active obese and overweight people tend to have a lower rate of morbidity and mortality than normal weight but hypoactive people [23]. An inactive lifestyle and the accompanying moderate cardiorespiratory performance ability carry the same source of risk as obesity.

During the academic years of college and university, sedentary lifestyles tend to be typical, the direct outcome of which is a change in body composition and cardiorespiratory performance. Since the 1970s, common changes in living standards and lifestyles have resulted in the decreasing physical performance of children, adolescence, and young adults, while body fat as a percentage of body mass has increased [7,20]. Gáldi [14] stated that only 30% of those aged between 15 and 84 perform regular physical activity in Hungary, and there is a linear decrease in practicing sports with the age. According to this study, regular physical activity is performed by 49.9% of those aged between 20 and 29, and there is a correlation between the frequency of physical activities performed and the level of education.

With the help of a motor test and the measurement of selected body parameters, the fitness level of a given age group can be determined. Although the application of motor tests and fitness measurements is part of curriculum requirements, it is not widespread in the higher education system, despite the fact that there are many opportunities to train future educators and experts in fields of health and fitness. The aim of this study was to assess body composition, cardiorespiratory fitness and health awareness in female university students differing in volume of obligatory physical activity.

Material and Methods

The study sample (n = 109) was selected from full-time female students in teacher training, social pedagogy, tourism and catering, recreation and health promotion courses at the University of West Hungary, who were enrolled for the 2006-07 academic year. A stratified random sample was used in selecting the year and date of enrolment. The sample was divided into two groups according to frequency and volume of obligatory physical activity classes. The first group was composed of the recreation and health promotion students (RHE; n = 27) who depending on the semester, were participating in compulsory regular physical activity 2-4 times a week (60-80 minutes per session), the second one comprised of students of teacher training, social pedagogy, tourism and catering (STT; n = 82) who did physical exercise 30-40 minutes 0 - 2 times a week. All subjects gave their written consents to participate in the study; the research was approved by the local Committee of Ethics.

In all subjects body height and body mass were measured according to standard anthropometric procedures, from these BMI (body mass index) was calculated. As in Hungary no current reference values of BMI are available, classification of BMI used are according to WHO recommendations. WHO has established 11 different categories of BMI, however in this study subjects were classified to one of the 3 following categories: underweight (<18.49), normal (18.50-24.99) and overweight (>25). For the estimation of percentage body fat content and muscle mass the InBody 720 bioelectrical impedance scanner was used [31]. InBody 720 (Biospace Co, Korea) is a multi-frequency impedance plethysmograph body composition analyser which takes readings from the body using an eight-point tactile electrode method, measuring resistance at five specific frequencies (1 kHz, 50 kHz, 250 kHz, 500 kHz, and 1 MHz) and reactance at three specific frequencies (5 kHz, 50 kHz, and 250 kHz). In the measuring process the technical prescriptions of the International Biological Program were followed [30].

Health behaviour of subjects was assessed using the Győr-Moson-Sopron County ÁNTSZ Health Protection Department's "Habitude survey of the Adult Population" questionnaire [2]. It consisted of closed-ended questions and scales in the following fields: self-evaluation (self-confidence, shyness), future prospects (hope, hopelessness), nutritional habits (quality, frequency), harmful addictions (smoking, drug abuse, and alcohol consumption), and physical activity (regularity, quantity) [25]. Questions were directed to determine frequency of free time physical exercise lasting for at least 20 minutes per day (0 – 7 days/week), the level of satisfaction in relation to

perceived health status (3-point scale), the frequency of perceived fatigue per week (4-point scale), and any harmful addictions, such as smoking or alcohol consumption (5-point scale).

The motor performance test was used for the measurement of cardiorespiratory performance in the sub-max zone with the Rockport Fitness Walking Test (1-Mile) to estimate relative $\dot{V}O_2$max (ml/kg/min). It was decided to select the test most suitable for hypoactive persons' in order to best assess their motor performance as, from a methodological point of view this is the primary criteria of objective data recording. Based on this, it was supposed that the walk test would be acceptable for the students, and at the same time it would motivate them to perform better. The equation to predict maximum $\dot{V}O_2$ according to Fox's physiological basis for exercise and sport is for the Rockport Fitness Walking Test as follows:

$\dot{V}O_2$max = 132.853 - (0.0769 × body mass) - (0.3877 × age) + (6.315 × gender) - (3.2649 × time) - (0.1565 × heart rate).

The students covered the one-mile distance in windless weather conditions with fast walking, the time of which was measured and recorded by a time-measuring appliance. The maximum heart rate was assessed with the Polar Accurex Pulse Rate Monitor and processed with Polar Precision Performance 3.0 Software (Version 4.00.020). The relative aerobic capacity of the tested persons was estimated with the programme available on the website (http://www.brianmac.dempn.co.uk/rockport-htm).

Statistics for Windows (version 7.1, StatSoft Inc., Tulsa, OK 74104, USA, 2006) was used for the data analysis. In case of body characteristics and cardiorespiratory variables differences between the means were assessed by using t-test for independent samples, the data pertaining to health awareness were analyzed with the use of U Mann Whitney test. The frequencies were assessed by using the chi-square function. The level of $\alpha = 0.05$ was considered significant.

Results

The anthropometric characteristics of studied subjects are presented in Table 1. No significant differences between both groups were found for age and most of the somatic variables, however variability of body mass among STT students was relatively higher as reflected by higher coefficients of variability (CV = 19.6% and 11.7% for SST and RHE respectively) and ranges (40-99 kg and 45-74 kg, respectively). Moreover, students from STT group tended ($p = 0.087$) to have higher values of percentage body fat as compared to RHE students.

According to WHO classification, respectively 4 (14.8%) and 8 (9.7%) students from RHE and STT were classified as underweight, 21 (77.0%) and 54 (65.8%) had normal values of BMI, while 2 (7.4%) and 20 (24.4%) individuals were overweight ($p<0.05$).

Table 1. Mean (±SD) values and ranges of anthropometric features recorded in female university students

Group Variable	RHE (n = 27)	STT (n = 82)
Age (years)	19.5 ± 1.3 18 ÷ 23	19.3 ± 1.0 18 ÷ 22
Body height (cm)	167.0 ± 4.9 156 ÷ 176	165.3 ± 6.6 152 ÷ 183
Body weight (kg)	62.6 ± 7.3 45 ÷ 74	62.4 ± 12.2 40 ÷ 99
Body Mass Index	22.4 ± 3.0 17 ÷ 27	23.0 ± 4.4 16 ÷ 34
Muscle mass (%)	41.2 ± 4.6 35.0 ÷ 46.6	39.1 ± 5.0* 25.6 ÷ 46.5
Body fat (%)	25.2 ± 5.4 16 ÷ 37	28.0 ± 7.8 º 13 ÷ 50

Legend: RHE - recreation and health development programmes, STT - social pedagogy, tourism and catering, teacher training programmes; º Tends to differ from RHE group ($p = 0.087$); * Significantly ($p<0.05$) different from RHE group.

Characteristics of the groups' health behaviour are presented in Table 2. The frequency of taking up regular leisure physical activity was significantly higher in the RHE than in SST group (3.0 ± 1.4 and 1.3 ± 1.1 days/week, respectively). It is of interest that among the RHE students were as much as 9 (33%) subjects whose regular physical activity did not meet the recommended minimum of activity of at least 3 times a week, while in STT group the respective percentage amounted to 89% (72 subjects). In case of other health behaviour i.e. perceived health, feeling of morning fatigue and harmful habits – smoking or alcohol consumption no significant between-group differences were noted, however in both groups the symptoms of unhealthy behaviour were observed. Namely, about 22% of RHE and SST students (6 and 19 subjects, respectively) declared everyday smoking and more than ¼ of them admitted alcohol consumption at least once per week (26 and 28%, respectively).

The results of the cardiorespiratory performance test (Rockport Fitness Walking Test) was presented in table 3. Students from RHE group covered the one-mile distance by about 1.5 minute faster ($p<0.001$) than the female students from the SST group. According to classification made with the use website programme the RHE students' time obtained in one-mile walk was "excellent", while STT students' was "good". Moreover, the RHE students had significantly ($p<0.001$) higher values of estimated $\dot{V}O_2$max as compared to their mates from SST group

(45.4 ± 3.5 and 39.8 ± 5.0 ml/kg/min, respectively), while the maximum heart rates were in both groups comparable.

Table 2. Mean (±SD) values, medians and ranges of health-related variables recorded in female university students

Group / Variable	RHE (n = 27)	STT (n = 82)
Physical activity (days/week)	3.0 ± 1.4 (3) 0 ÷ 5	1.3 ± 1.1 (3)*** 0 ÷ 6
Perceived health (3-point scale)	2.2 ± 0.6 (2) 1 ÷ 3	2.4 ± 0.5 (3) 1 ÷ 3
Perceived fatigue (4-point scale)	2.5 ± 0.8 (2) 1 ÷ 4	2.7 ± 0.8 (3) 1 ÷ 4
Smoking (5-point scale)	2.6 ± 1.6 (2) 1 ÷ 5	2.5 ± 1.7 (3) 1 ÷ 5
Alcohol consumption (5-point scale)	2.7 ± 1.1 (3) 1 ÷ 5	2.8 ± 1.0 (3) 1 ÷ 5

Legend: RHE - recreation and health development programmes, STT - social pedagogy, tourism and catering, teacher training programmes; *** Significantly ($p<0.001$) different from RHE group

Table 3. Mean (±SD) values and ranges of motor performance variables recorded in female university students

Group / Variable	RHE (n = 27)	STT (n = 82)
Time (min)	14.3 ± 0.3 13.4 ÷ 15.3	15.7 ± 1.0 *** 3.6 ÷ 19.4
Heart rate (bpm)	147.0 ± 21.1 100.0 ÷ 182.0	151.1 ± 18.8 112.0 ÷ 198.0
$\dot{V}O_{2\,max}$ (ml/kg/min)	45.4 ± 3.5 39 ÷ 52	39.8 ± 5.0 *** 24 ÷ 47

Legend: RHE - recreation and health development programmes, STT - social pedagogy, tourism and catering, teacher training programmes, *** Significantly ($p<0.001$) different from RHE group

Discussion

Studied female university students seem to be of average height and body mass as the mean values and variances of both somatic traits are similar to other Hungarian samples [28]. Relative high variance of the body mass observed mainly among STT students refer to the body compositional differences derivate from nutritional status. Although no differences between the groups according to BMI were found, relatively higher variance was observed among SST students reflecting heterogeneity of the students' nutritional status. In most of the studied subjects (RHE - 77.0%, STT - 65.8%), the body mass index was within normal limits, however especially among SST students the prevalence of overweight was relatively high and amounted to about 25%. Cole et al. [10] consider prevalence of thin subjects to be of equal importance while evaluating the nutritional status, although in developed societies it is rather a consequence of fashion than negligence; the percentages of underweight subjects were in both groups alike (about 11%).

There are many methods for the estimation of muscle mass, however when evaluating the data it was difficult to find valid reference values. In this study the recommendation of Drinkwater and Ross was used [12]. Although there were significant differences between the groups, the mean percentage muscle mass in the physically active group (RHE) hardly reached the minimum level which is physiologically required. The development of muscle mass in STT students are under the required level which can be attributed to the lowered physical activity. Therefore their results are not surprising, taking into consideration both body composition and lifestyle characteristics.

Significant differences between the two groups, regarding healthy behaviour, have only been found in the frequency of taking up leisure-time physical activity; the number of days in week devoted to physical exercises being significantly higher in RHE students (3.0 vs. 1.3 days/week). Although no significant between-group differences were found, in perceived health and perceived fatigue during the week in both groups the symptoms of unhealthy behaviour were observed. Among Hungarian college students smoking and alcohol consumption are the most frequent examples of harmful behaviour. Smoking was reported in 67% of boy and in 61% of girls while regular alcohol consumption was observed in 49% of males and 27% of females [1]. Our results are well comparable with the results of the European Health and Behaviour Survey reported by Kopp and Skrabski [17]. In healthcare, and more specifically preventive health activity, RHE students nearly reached the required level only in the field of physical exercise. Full awareness of being healthy can only be reached if students decide to make lifestyle changes; hence a physically active lifestyle is only complete if combined with healthy habits.

In the assessment of cardiorespiratory performance by using Rockport Fitness Walking Test, beneficial effects of augmented physical activity were found regarding achieved times and relative aerobic capacity values. An evident consequence of lowered activity is that the mean values of the estimated relative oxygen uptake in the STT group only reached the lower, required limit [7]. Relative variance of maximum heart rates were comparable in both groups (CV = 14.6 and 12.4% in RHE and SST students respectively), however the differences in scatter were prominent, which illustrate properly the dif-

ferences of the fitness level. The state of the cardiorespiratory system greatly depends on regular physical activity, thus the inevitable decrease in aerobic performance can be slowed down. Maffeis *et al.* [19] claim that decreased aerobic activity is fundamentally the consequence of a lifestyle which put less emphasis on exercise factor. The question becomes more complex when comparing the development of aerobic performance in young people with normal body mass and in those who are overweight. Similar consequences are seen in reports of Fletcher *et al.* [13] and Cole *et al.* [9,10]. According to Cureton *et al.* [11], a person's body composition or at least relative body fat level has to be taken into consideration while evaluating the cardiorespiratory performance of hypoactive test participants. Among the students from RHE, the optimal muscle mass and the body fat level (which is within the normal range) prove the beneficial effect of desired body composition. The result of an unfavourable proportion of muscle mass and fat affecting aerobic performance can be clearly linked to the significantly lower performance level in cardiorespiratory test among STT students.

The certain limitation of presented study was the fact the examination was not representative for the Hungarian young women as it covered only a specific segment of society. Although the findings do not allow broader generalisation, the presented results give an outlook on somatic and fitness characteristics as well as on behaviour patterns among female university students. Results of performed tests were discussed with the students in theory lessons during which they were given advice on health and fitness. They were encouraged to accept the fact that sport and exercise are a vital part of a healthy lifestyle. A discussion was held on the effects of preventative health care, mental hygiene, proper diet, physical activity and sport and students learnt how body composition and the condition of the cardiorespiratory system can be significantly improved. These facts also support the need for including obligatory physical education classes in university curriculum and the importance of education and promotion of healthy behaviour among the students.

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Received 26.11.2010
Accepted 01.07.2011

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