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ORIGINAL

Development of body morphology of Iraqi students: sedentary way of life and fatness

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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abstract

Background The aim of the research was to compare morphology of Iraqi students of the first and fourth years of study with mostly sedentary style of life.

Material/Methods The research involved 88 students of the first year of study and 88 students of the fourth year of study of the University of Baghdad, Baghdad, Iraq. Basic anthropometric measurements were taken of the body mass, straight-linear dimensions, parts of extremities' circumferences, skin-fat folds.

Results The fourth-year students had significantly greater body mass as compared to the first-year students. Their linear dimensions were higher, even though insignificantly; their circumferences and skin-fat folds were significantly higher. BMI was for both groups within a norm, but the fourth-year students had a greater value of this index.

Conclusions It could be concluded that the sedentary style of life was the reason for higher values of body dimensions, especially skin-fat folds, in students of the fourth year of study. Another reason was probably lack of exercise and westernization of lifestyle, especially fast food consumption. The city and university administration should establish places for all people in order to prepare the neighbourhoods for exercising.

Key words Iraq, students, sedentary life, body anthropometry

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INTRODUCTION

There have been several declarations on health promotion adopted in the last 30 years throughout the world. Always the process of enabling people to increase control over and to improve their health was of concern. Health is seen as a resource for everyday life. It is a positive concept emphasizing social and personal resources, as well as physical capacities [1].

The European Union Health Strategy "Together for Health" supports investing in health. This is one of the preconditions for economic prosperity. Europe invests in people's health, particularly through health-promotion programs [2, 3]. One of the ways of promoting health is physical activity. This would give better body morphology, especially avoidance of excess of adipose tissue and better physical fitness [4]. Other countries in the world, especially developing countries, like Iraq, should follow this way of health promotion.

According to European Union directives concerning physical activity, the main problem is to fight against numerous diseases of civilization and promote health among people. The last three decades have seen the levels of overweight and obesity in the EU population rise dramatically, particularly among children, where the estimated prevalence of overweight was 30% in 2006 [5]. Therefore, there is a need to diagnose the current condition of EU citizens including students at universities and finding new areas of activity and physical fitness development. To change students' physical habits, they should be more aware of how physical activity can have a good influence on their health and life and develop their fitness [6]. Not only in Europe, but also in the rest of the world lack of physical activity is an essential problem, which has negative influences on human health.

According to Przewęda [7], with each decade young people are becoming somatically heavier (higher body mass) and motor weaker (low physical fitness). The model of divaricating scissors describes changes in the condition of movement in youth: more and better morphological development is accompanied by getting a worse level of capacity and fitness. This asymmetry of development deepens with each decade, destroying the structure of the physical condition and posing a threat to positive health of students in the following decades.

One way of diagnosing public health is to assess body morphology. There are several descriptions of the body including: body dimensions, body height and mass ratio (e.g. Body Mass Index), volume of the adipose tissue, and others. Despite the fact that the BMI does not take into account tissue composition of the body (e.g. the muscle and the adipose tissues), it is good for a general description of body's morphology. First-year students of the major "Physical Education" in Poland have their BMI value at 22–26 [8]. This value can be taken as a reference for other young men having in mind that those males have more muscle tissue than others.

In order to control body dimensions and composition, especially the amount of the muscle and the adipose tissue, one needs to control the input of energy, its transformation within the body, and also the output of energy. The input of energy is obtained with food. This could be of different chemical compounds – proteins, fats, and carbohydrates. The transformation takes into account

the number of meals during a day (better to eat five times a day than twice a day), the body state while eating (one should eat in a peaceful situation, without being in a hurry, etc.), the proper amount of digestion acids and other problems. The output of energy means moving the body through substantial distance and velocity to overcome external loads by carrying goods, by riding a bicycle, swimming etc.

Unfortunately, some people have wrong energy control. The energy flow is unbalanced. Some people have too big an input (they eat too much or they are obese), some have too small an input (they are hungry or they suffer from bulimia or anorexia). Still other people have too small an output (sedentary life) while others have too big an output (too heavy work). The examples of unbalanced and balanced energy among the youth are presented in Fig. 1.

Fig. 1. Youth of different body type (from the left): obese, anorectic, normal (Gdansk, Poland)

In the 21st century people spend a lot of time sitting and working on computer, watching TV, playing virtual games. They also like to eat fast food, which has no healthy characteristics. This type of life can increase the amount of fat tissue.

Many studies show that increased body fat and low physical activity are associated with several diseases, like cardiovascular disease [9, 10], hypertension [11, 12], diabetes mellitus [13, 14]. Also numerous studies conclude that overweight is increasing and aerobic fitness is declining in school-aged children and youth [15, 16]. According to Eriksson et al. [17], the risks of unfitness and obesity are cumulative, tracking from childhood to adulthood. For the future public health this situation is very worrying.

With an increase in sedentary habits among the Iraqi population and increase in the presence of fast food among the Iraqi youth it is estimated that the number of youth with a higher amount of the fat tissue is growing, despite their families' low income. Iraq's gross domestic product (GDP) per capita based on the purchasing power parity (PPP) is about US$15,300 (in Poland it is US$25,200 and in the US US$54,400). Around 25% of the population live below the poverty line (in Poland it is 11%, in the US 15%) [18].

The aims of the research were: 1) to determine body morphology of selected Iraqi students from the first and last year of study, 2) to try to explain the reason for the differences, if any. It was hypothesized that among Iraqi students those from the 4th year have significantly greater body dimensions comparing to the 1st-year students, especially taking into account the amount of the fat tissue.

MATERIAL AND METHODS

MATERIAL

The subjects of the study were Iraqi male students from Baghdad University. They represented different faculties: College of Education, Department of Psychology, Department of Mathematics, Faculty of Management and Economics, Faculty of Law, Faculty of Pharmacy. They were chosen as students with mostly sedentary way of life.

The study included two student groups: 1) the first year of study: 88 students, 18 years old, and 2) the fourth year of study: 88 students, 22 years old. At the age of 18-22 years maturation stops and body changes are small. Usually, body development and most motor abilities in this group are already structured.

Generally, students' material conditions were similar. They were mostly of medium and good level. Some students described their conditions as low. There were no very low conditions of life described by students (Fig. 2).

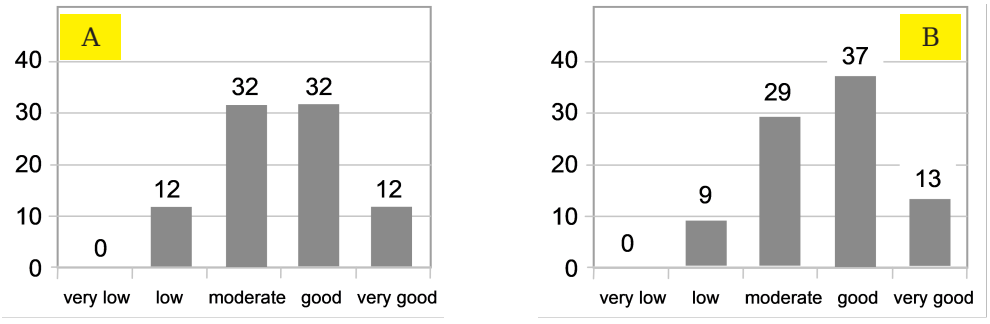

Fig. 2. The number of students with different material conditions from the 1st year (A) and 4th year (B) of study

METHODS

Scales with the accuracy of measurement 0.1 kg were used for body mass measurements. An anthropometer was used for the body length. Readings of the measurements were done up to 0.1 cm. The following lengths were measured: whole body, upper and lower extremities, foot, hand. An elastic tape was used to measure the following circumferences: chest inhale and exhale (at the level of nipples), waist (at the narrowest place), and the maximal circumferences were measured for arm, thigh and calf. A calliper was used to measure the following skin-fat folds: shoulders (subscapular), abdomen at the side of the navel, arm at the back and at the centre of length, thighs at the front and at the centre of length.

The body mass index (BMI) was calculated by dividing body mass (kg) by squared height (m^2). For normally developed people (not sportspersons) the following levels were adopted based on the WHO norms [19, 20]: underweight below 18.50, normal mass between 18.50 and 25.00, overweight between 25.0 and 30.00, obesity above 30.00.

STATISTICAL ANALYSIS

Basic statistical data were obtained: mean m, standard deviation SD, coefficient of variance V, difference of means d. To check if there are significant differences

between the investigated features, t-Student Independent Sample Test was used. The level of ∝ = 0.05 was chosen for the significance of difference. For degrees of freedom equalling N = 88 + 88 – 2 = 174, a significant value tα = 1.974. For the level of significance of differences, the p value was presented.

RESULTS

MASS OF THE BODY

The mean body mass for the 1st-year students equalled m.1 = 62.38 kg (SD.1 = 5.915, V.1 = 9.48), while for the 4th-year students it equalled m.4 = 69.07 kg (SD.4 = 6.639, V.4 = 9.61). The difference of means d = 6.69 kg was significant (p = 0.000).

LENGTHS OF THE BODY

The mean total body height of the 1st-year students equalled 172.81 cm and of the 4th-year students 174.39 cm. The difference of 1.6 cm was insignificant. From all body parts only lengths of upper extremities almost significantly differed. Dispersion of all results was small. The coefficient of variance in almost all cases did not exceed the value of 10.0. Detailed statistical results of mass and lengths are presented in Table 1.

Table 1. Morphology of students: mass (kg) and lengths (cm)

Quantity	1st year			4th year			Difference of means	
	m	SD	V	m	SD	V	d value	p value
Body mass	62.38	5.19	9.48	69.07	6.64	9.61	6.69	**0.000**
Body height	172.81	7.15	4.13	174.39	6.36	4.13	1.58	0.123
Upper extremity length	73.86	5.44	7.37	75.42	4.47	5.92	1.56	**0.040**
Hand length	19.67	1.54	7.85	19.95	1.49	7.48	0.28	0.216
Lower extremity length	94.58	6.01	6.36	94.64	9.80	10.35	0.06	0.963
Foot length	23.74	1.72	7.24	24.00	1.78	7.42	0.26	0.323

Differences in bold are significant

CIRCUMFERENCES OF THE BODY

Circumferences of body parts are even more concentrated than lengths. Coefficients of variance reached the highest value of 7. For the trunk at the level of waist this value in mean data did not exceeded 80 cm for both the 1st and the 4th year of study. Almost all data of the differences of mean circumferences were significant (except for the calf). Detailed statistical results of circumferences are presented in Table 2.

Table 2. Morphology of students: circumferences (cm)

Body part	1st year			4th year			Difference of means	
	m	SD	V	m	SD	V	d value	p value
Chest/inhalation	89.30	3.33	3.73	93.17	4.47	4.80	3.88	**0.000**
Chest/exhalation	85.18	4.08	4.79	87.73	4.77	5.44	2.55	**0.000**
Arm	24.98	1.69	6.78	27.68	1.97	7.11	2.70	**0.000**
Waist	72.06	3.66	5.08	79.07	5.60	7.08	7.01	**0.000**
Thigh	49.92	3.51	7.04	53.19	3.49	6.56	3.27	**0.000**
Calf	34.63	1.91	5.51	34.84	1.80	5.17	0.22	0.441

Differences in bold are significant

SKIN-FAT FOLDS

For all skin-fat folds the values did not exceeded 17 mm. But the dispersion of data was higher than for the previous quantities. Here the highest value of the coefficient of variance was for the skin-fat fold for abdomen for the 4th-year students, reaching almost 28%. The differences for almost all mean data were significant (except for the subscapular fold). Detailed statistical results of skin-folds are presented in Table 3.

Table 3. Morphology of students: skin-fat folds (mm).

Body part	1st year			4th year			Difference of means	
	m	SD	V	m	SD	V	d value	p value
abdomen	10.84	2.48	22.84	16.19	4.52	27.94	5.35	**0.000**
triceps	8.03	1.56	19.39	9.35	2.47	26.39	1.32	**0.000**
subscapular	10.90	1.89	17.30	11.23	1.95	17.34	0.33	0.254
thigh	12.43	2.63	21.17	14.63	3.97	27.11	2.20	**0.000**

Differences in bold are significant

DISCUSSION

Taking into account students' morphology at the first and fourth years of study, significant differences in body mass were due to higher lengths and higher circumferences of body parts. The mean sum of body lengths comprising the body height, the upper extremity length, and the feet length for the first-year students equalled 270.41 cm and for the fourth-year students 273.81 cm. This difference of 3.40 cm, though insignificant, was due to still growing body of males at 18–20 years of age.

There were higher circumferences for all measured body parts for the fourth-year students (here almost all differences were significant). The mean sum of body parts' circumferences (for the chest mean data at inhalation and exhalation were taken into account) for the first-year students it equalled 356.06 cm, and for the fourth-year students 375.68 cm, and the difference of 19.62 cm was significant.

Except for the region near the scapula, all other fat-skin folds were significantly higher for students of the 4th year of study. The mean sum of four fat-skin folds for the first-year students equalled 42.20 mm, and for the fourth-year students 51.41 mm, with the difference of 9.21 mm being significant.

An assumption was made that four years of sedentary lifestyle and lack of physical activity was the reason for those higher fat-skin folds. In addition, westernization of youth's life, especially consuming fast food, is also the reason why older students have got more fat tissue.

According to Krzyżanowska and Umlawska [21], Polish students (from Wroclaw universities) measured in 1998 had the mean body height of 180.52 cm (SD = 6.49) and the mean body mass of 73.85 kg (SD = 8.72). These data were significantly higher as compared to Iraqi students described in this article. Since Polish authors did not give the year of study of Polish students, for Iraqi students mean data of the first and fourth year of study were taken into account.

Dawal et al. [22] presented data on the population of 74 students from the University of Malaya (Kuala Lumpur, Malaysia). The students presented in that paper were 22.55 years of age so they were comparable to the Iraqi students of the fourth year of study. Students from the University of Malaya were in 69.93% of Malay, in 22.38% of Chinese, and in 7.69% of Indian origin. Their mean body stature equalled 170.49 (SD = 5.40), and the mean body mass equalled 67.28 kg (SD = 13.52). South-East Asia students were significantly smaller as compared to Iraqi students. Their body mass was also smaller, but the difference was insignificant.

Nakanishi and Nethery [23] in a paper devoted to the comparison of Japanese and American male university students gave data on the height and mass of the samples of those two populations. Japanese students (born and raised in Japan) had the mean body height of 171.8 cm (SD = 5.4) and the mean body mass of 62.1 kg (SD = 5.8). Iraqi students were higher than Japanese students, but this difference was insignificant. Iraqi students were heavier than Japanese students, and this difference was significant. American students (born and raised in the USA, Caucasian Americans) had the mean body height of 180.6 cm (SD = 5.7) and the mean body mass of 78.6 kg (SD = 9.1). Iraqi students were both smaller and lighter than American students. Both differences were significant.

It is well known that part of the American population, including students, have their consumption based on fast food and leave inactive, sedentary lifestyle. This is a source of body mass over the norm (Fig. 3A). In the later years this can lead to obesity. With the westernization of Iraqi lifestyle, Iraqi youth are going to be similar to the American youth in the future. Quite a different situation exists in Ethiopia. In this country, where the Gross National Product (US$1,600) is much lower than in the United States, and there is 39% of labour force unemployed [18], people are of lean or normal body build (Fig. 3B).

Fig. 3. Youth of the countries with different personal income: A – with body mass over the norm (high income; New York, N.Y., USA), B – with body mass in norm (very low income; Addis Ababa, Ethiopia)

The authors obtained the following data of BMI for students of different countries: 1) a) Iraq 1st year: 20.89, b) Iraq 4th year 22.70; 2) Japan 21.04; 3) Malaysia 23.14; 4) Poland 22.66; 5) USA 24.10. The abovementioned data show all students had a normal value of the BMI (between 18.5 and 25.00). Iraqi 1st-year students had the lowest data and US students had the highest data. But Iraqi 4th-year students had a higher BMI than students from Japan, where economy is at a much higher level than in Iraq.

CONCLUSIONS

Students all over the world, including Iraq, should be aware of wrong lifestyles. One can assume that a higher amount of the fat tissue in older students is a result of a wrong diet and wrong movement behaviour. Especially eating fast food and at the same time not exercising is a reason why people are getting more fat tissue.

The city and university administration should establish places for all people in order to prepare the neighbourhood for exercising. But for now people should know they can exercise without recreation and sport facilities by using the existing environment and their own bodies as a load for exercises.

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