THE CONSEQUENCES OF LACK OF PHYSICAL EXERCISE ON SPINE ALIGNMENT AND BODY WEIGHT IN UNIVERSITY STUDENTS

CONSECINȚELE LIPSEI EXERCIȚIULUI FIZIC ASUPRA ALINIAMENTULUI CORPORAL ȘI ASUPRA GREUTĂȚII LA STUDENȚI

Voinea Andreea[11]

Keywords: spinal disorders, body mass index, physical exercise

Cuvinte cheie: tulburari de statică, indice de masa corporală, exercițiu fizic

Abstract
Introduction: The spine is supposed to have a slight degree of curvature to it so it can absorb the daily stress of movement. If this natural curvature becomes too excessive there is misalignment.
Aim: The aim of the study was to investigate the body posture, the body mass index and the level of physical activity in university students.
Method: The study was conducted on 560 students - 356 females and 204 males, with an age average of 19 years old. From the research methods were used the direct observation, anthropometric measurements and the interview technique. The body mass index will be used in order to determine if a person is underweight, normal weight, overweight or obese.
Result: 30% of students adopt a correct body posture and about 80% of girls and 65% of boys have a weekly organized physical activity only during the physical education classes. The number of lordotic deficiencies is higher for girls and the number of kyphosis deficiencies is higher for boys. 44% females are accusing back pain at least once a week. 207 students (36,96%) have weight problems, 85 students (15,18%) are underweight and 122 students (21,78%) are overweight. 21,34% of females are underweight and 18,8% are overweight. 26,96% males are overweight and 4,41% are underweight.
Conclusion: Students are less interested in movement and sport, spending a lot of time in front of the computer. The study has provided that little or no physical activity is related to the risk of develop a vicious body posture and weight problems.

Rezumat
Introducere: Coloana vertebrală prezintă curburi fiziologice normale necesare absorbției oscilațiilor mecanice datorate mișcării. Dacă aceste curburi sunt accentuate apare lipsa aliniamentului corporal.
Scop: Scopul studiului a fost de a investiga postura corpului, indicele de masă corporală și nivelul de implicare în activitătate fizice sportive la studenți.
Metodă: Studiul a fost realizat pe 560 studenti – 356 de sex feminin, 204 de sex masculine, cu o medie de vârstă de 19 de ani. Metodele de cercetare folosite au fost observația directă, măsurătorile antropometrice si interviul. Pentru a stabili dacă o persoană este subponderală, supraponderală sau obeză se calculează indexul de masă corporală.
Rezultate: 30% dintre studenti adoptă și mențin o postură corporală corectă și 80% din fete și 65% din băieți au activități fizice regulate și organizate doar în cadrul orelor obligatorii de educație fizică. Numărul deficiențelor de tip lordotic este mai crescut în cazul fetelor și cele de tip cifotic în cazul băieților. 44% din fete acuză dureri de spate cel putin o dată pe săptămână. 207 din totalul studenților au probleme de greutate, 85 (15,18%) fiind subponderali și 122 (21,78) fiind supraponderali. 21,34% din studente sunt subponderale, 18,8% sunt supraponderale, 26,96% din studenți sunt supraponderali și 4,41% sunt subponderali.
Concluzii: Studenții sunt din ce în ce mai putin interesați de activitatea fizică și de sport. Studiul a demonstrat că lipsa activității fizice poate conduce la atitudini posturale deficitare și probleme de greutate.

[11]Assistant Lecture, Department of Physical Education and Sport, The Bucharest University of Economic Studies
Corresponding author: andreea_voinea1981@yahoo.com

Introduction
        Continue technology of life contributes to avoid physical exercise. Regular physical activity has been proven to help prevent a wide variety of health problems. Influence of practicing systematic physical exercise is visible in the external shape of the body, in its proportional development and in maintaining a proper body weight. The decline of physical activity is considered to play an important role in the deterioration of health predictors and in the outer shape of the body.
        ,,Structural and functional changes of the spine can be caused by something trivial such as a faulty posture. If neglected, it can cause structural changes of the spine, which affects its morphological changes and normal development and inherently leads to strains of various degrees, which in turn drastically affect the long-term functionality of the spine.'' [1].
        The anatomically normal developed spine in an adult individual contains four curvatures with a concave base in the sagittal plane, two backward concave curvatures in the cervical and lumbar areas, and two forward concave curvatures in the thoracic and sacral areas. The spine is vertical in the frontal plane. [2]
Spine curvature disorders
        ,,The physiological curvature deviations of the spine from those considered normal finally lead to the onset of physical deficiencies of this axial system which provides the entire attitude of the human body.'' [3]
        Scoliosis is a medical condition in which a person's spine has a sideways curve. The curve is usually "S"- or "C"-shaped. In some the degree of curve is stable, while in others it increases over time. Pain is typically not present. Diagnosis is confirmed with plain X-rays. Scoliosis is typically classified as either structural in which the curve is fixed or functional in which the underlying spine is normal. The cause of most cases is unknown but believed to involve a combination of genetic and environmental factors. ,,Mild scoliosis generally does not cause pain, problems with movement, or difficulty breathing. It may only be diagnosed if it is noticed during a regular physical examination or a scoliosis screening at school. The most common signs of the condition include a tilt or unevenness (asymmetry) in the shoulders, hips, or waist, or having one leg that appears longer than the other. A small percentage of affected children develop more severe, pronounced spinal curvature." [4]
        Scoliotic attitude is a simple lateral deflection of the spine, reducible and without rotation of the vertebrae. Column curves of less than 10 degrees are considered normal.
         A normal thoracic spine extends from the 1st to the 12th vertebra and should have a slight kyphotic angle, ranging from 20° to 45°. [5] When the "roundness" of the upper spine increases past 45° it is called kyphosis. The cause is not currently known and the condition appears to be multifactorial and is seen more frequently in males than females. ,,Kyphosis is an extremely common musculoskeletal imbalance brought on by prolonged time in some postural positions, exercise and/or activity choices, environmental factors, myofascial dysfunction and psychological stress."[6]
        Kyphosis can occur as a deformity solely in the sagittal plane, or it can occur in association with an abnormality in the coronal plane, resulting in kyphoscoliosis.
        Kyphosis attitude is a deviation from the normal of spine that can be autocorrected by awareness of body position and improvement of vicious body posture. The body tendency to adopt a kyphosis position but that can be self-correcting by straightening the back.
        The term *lordosis* refers to the normal inward lordotic curvature of the lumbar and cervical regions of the human spine. Lumbar hyperlordosis is a common postural position where the natural curve of the lumbar region of the back is slightly or dramatically accentuated. The lumbar spine should be in 40° to 60° of lordosis. [5] Lordosis is found in all age groups. It primarily affects the lumbar spine, but can occur in the neck (cervical). When found in the lumbar spine, the patient may appear swayback, with the buttocks more prominent, and in general an exaggerated posture. Lumbar lordosis can be painful and sometimes affecting movement.

Kyphosis-lordosis posture is a posture characterized by a convex curvature of the thoracic spine and an inwardly curved lower back resulting from the pelvis being tilted forward.

Lordosis attitude is a deviation from the normal of spine that can be autocorrected by awareness of body position and improvement of vicious body posture. The body tendency to adopt a lordosis position but that can be self-correcting by straightening the back.

„The patient who suffered a deformation of the spinal column in time comes to acquire some position skills he isn't aware of, just because the interoceptors don't act normally anymore. That's why is necessary a corrective, outer force, for the patient to be aware- step by step, again- of his correct position and to be able to stimulate his adequate mechanisms, which allow him to self-correct.''[7, pg.10]

In order to determine if a person is underweight, normal weight, overweight or obese it's used body mass index. BMI is a person's weight in kilograms divided by the square of height in meters. A high BMI can be an indicator of high body fatness. For adults, BMI is interpreted using standard weight status categories. These categories are the same for men and women of all body types and ages. The standard weight status categories associated with BMI ranges are:

- Underweight   <18.50
  - Severe thinness   <16.00
  - Moderate thinness   16.00 - 16.99
  - Mild thinness 17.00 - 18.49
- Normal range   18.50 - 24.99
- Overweight   ≥25.00
  - Pre-obese   25.00 - 29.99
  - Obese ≥30.00
  - Obese class I   30.00 - 34.99
  - Obese class II 35.00 - 39.99
  - Obese class III≥40.00.   [8]

Pourpose: The aim of the study was to investigate the body posture, the body mass index and the level of physical activity in university students. In according with the results it was wanted to be made a paralell between physical activity behaviors and students' vertebral disorders and between physical activity and students' weight problems.

The study wanted to provide that little or no physical exercise is related to the risk of develop a vicious body posture and the lack of physical activity leads to problems related to body weight.

Matherial and Methods

The study was an ascertaining one and it was conducted in April, May, October 2017 in Bucharest Academy of Economic Studies sport halls, on a sample of 560 students, 356 females (63,57%) and 204 males (36,43%), with ages between 18 and 29 years old, average age 19,43 ± 1,31.

The direct observation, anthropometric measurements and the interview technique, were used as assessment means.

In assessing the subjects we used the direct subjective method, the somatoscopic assessment, consisting in the visual examination of the global and segment alignment of the body, from the front, back, and profile, in a static position and in action. The somatoscopic assessment examined the alignment of the shoulders line, the alignment of the pelvic line, the position of the head, shoulders, pelvis, the presence of the gibbosities, the exaggeration of the vertebral curves.

The weight and height of the subjects were determined in the anthropometric measurements, these were used for calculating the body mass index.

The interview had a number of eight questions. Four questions were dichotomous and four questions had multiple answers. The subjects were asked:

1. About their age.
2. If they have/had back pain at least once a week.
3. If they know of the presence of some static vertebral disorders.
4. If they did or do physical therapy.
5. If they have regular and organized physical activities weekly.
6. How many times a week they have physical activities.
7. What kind of sports activities practice.
8. Where do they practice physical exercises.

Results
Table 1 – Results of vertebral disorders and physical activity level

No	Investigated item	Females	Percent	Males	Percent	Total	Percent
1	Kyphoscoliosis	7	1,97%	11	5,39%	18	3,21%
2	Kyphosis-lordosis	13	3,65%	0	0%	13	2,32%
3	Kyphosis	22	6,18%	24	11,76%	46	8,21%
4	Kyphosis attitude	46	12,92%	38	18,63%	84	15%
5	Lordosis	32	8,99%	3	1,47%	35	6,25%
6	Lordosis attitude	47	13,20%	8	3,92%	55	9,82%
7	Scoliosis	39	10,95%	15	7,35%	54	9,64%
8	Scoliosis attitude	53	14,89%	28	13,73%	81	14,46%
9	Other disorders	3	0,84%	6	2,94%	9	1,60%
10	Correct posture	94	26.40%	71	34,80%	165	29,46%
11	Static vertebral disorders	262	73,60%	133	65,19%	395	70,53%
12	Vicious attitudes	146	41,02%	74	36,27%	220	39,28%
13	Vicious postures	116	32,58%	59	28,92%	175	31,25%
14	Back pain	158	44,38%	30	14,70%	188	33,57%
15	They knew of static vertebral disorders following medical controls (of total number of those with disorders)	171	65,27%	88	66,17%	259	65.56%
16	They made physical therapy (of those who knew)	42	24,56%	11	12,5%	53	20,46%
17	They do physical therapy.	6	3,50%	0	0%	6	2,31%
18	They never did physical therapy (of those who knew)	129	75,44%	77	87,5%	206	79,53%
19	They practice physical activity 2-3 times a week	61	17,13%	48	23,52%	109	19,46%
20	They practice physical activity 4-7 times a week	18	5,05%	25	12,25%	43	7,67%
21	They practice physical activity only in physical education class	277	77,81%	131	64,22%	408	72,85%
22	They do weight training (of those who do physical activity)	13	16,45%	39	53,42%	52	34,21%
23	Running (of those who practice physical activity)	26	32,91%	6	8,21%	32	21,05%
24	Games (of those who practice physical activity)	2	2,53%	20	27,39%	22	14,47%
25	Gym (of those who practice physical activity)	31	39,24%	0	0%	31	20,39%
26	Dance (of those who practice physical activity)	3	3,80%	1	1,34%	4	2,63%
27	Other sports (of those who practice physical activity)	4	5,06%	7	9,59%	11	7,24%

Table 1 – Results of anthropometric measurements

Statistical		Mean ± std. dev	Min.	Max.
MALES	Height	179,72±6,82	164	197
	Weight	75,47±13,09	48	130
	BMI	23,41±3,42	14,5	37
FEMALES	Height	165,76±6,21	190	150
	Weight	58,09±9,96	36	97
	BMI	21,18±3,64	15,4	37,9
TOTAL	Height	170±9,3	150	197
	Weight	64,42±9,96	36	130
	BMI	21,93±3,69	14,5	37,9

Discussion

The subjects represent the young generation. The females are between 18 and 28 years old with an average of 19.21 years and the standard deviation of 0,93 (1 - 28 years, 3 - 23 years, 7- 21 years, 104 - 20 years, 178- 19 years, 63- 18 years) and the males are between 18 and 29 years old with an average of 19,81 and the standard deviation of 1,33 (1- 29 years, 1 – 25 years, 3 – 24 years, 3 – 23 years, 7 – 22 years, 23 – 21 years, 70 – 20 years, 83 – 19 years, 13 – 18 years).

It is concerning that only 30% of students adopt a correct body posture, although vertebral static disorders cannot be considered secondary to other conditions, only 4 students said it's were secondary (1 crash accident , 1 clavicle fracture, 2 limb differences). Of the total static disorders, 55.70% are vicious attitudes due to a negligent body position and 44.30% are vicious posts. Also worrying it is the lack of concern about static vertebral disorders, only 20.46% of those who knew about column deficiencies did physical therapy and only 2.31% do physical therapy.

The number of lordotic deficiencies is higher for girls - 26% compared to 5.5% for boys. The number of kyphosis deficiencies is higher for boys - 36% compared to girls 20%. In this case we can assume a connection with the fashion of the bulging posterior for the girls and the fashion of the male man (excess of muscle mass and the upper body which is worked hard and incorrectly). 26% of girls and 21% of boys have scoliosis deficiencies. The increased number of scoliotic attitudes may be related to the wearing of the loaded handbag and the backpack on one shoulder.

Alarming is it also the increased number of back pains in girls case, 44% of them are accusing back pain at least once a week. Spinal pain can have a profound effect on a person's overall health, sometimes preventing them from working or even doing simple daily activities. "Spinal disorders are among the most common causes of hospital visits around the world. Most common spinal disorders include low back pain, neck pain scoliosis and disc disease, to name a few. Over 80 per cent of adults will suffer back pain at some point in their lives. 50% of the working population will experience back or neck pain symptoms at least once per year. Age is one of the most common risk factors for spinal pain, and the greatest effects of population ageing are predicted in low- and middle-income countries. Back and neck pain is one of the most common reasons for workplace sick leave," said Dr. Gautam R. Prasad, Spine Surgeon, Paras HMRI Hospital, Patna, at a press conference on the occasion of World Spine Day. [9]

207 students (36,96%) have weight problems, 85 students (15,18%) are underweight and 122 students (21,78%) are overweight. 143 of 356 females student have weight problems (40,17%) - 76 of 356 females student are underweight (21,34% of females) and 67 of 356 females student are overweight (18,8% of them) – 5 females are obese class I and 2 females are obese class II. 64 of 204 males student have weight problems (31,37%). 55 of 204 males are overweight (26,96%) – 10 males are obese class I and 1 male is obese class II and 9 males are underweight (4,41%).

It is noticeable that women have problems of underweight as well as overweight.

Underweight problems are associated with nutritional deficiencies, weakened immune system and fertility problems. The image of the perfect woman created by the media leads to an increased number of underweight women, the abnormality of normal is no longer differentiated.

It is known that the prevalence of overweight and obesity is rising. Excess weight may increase the risk for many health problems, including type 2 diabetes, high blood pressure, heart disease, strokes, certain types of cancer, sleep apnea, osteoarthritis, fatty liver disease, kidney disease and pregnancy problems. Both males and females have overweight problems, but among men, the prevalence of overweight is higher than females. The results of the study are close to the results of a 2014 study in which 22% students were overweight or obese (24.7% men and 19.3% women). [10]

Physical inactivity is one of the most important public health problems of the 21st century, and may even be the most important. Students said they do not have time for physical activity, about 80% of girls and 65% of boys have a physical activity organized weekly only during the physical education classes. The sedentary lifestyle adopted due to lack of time is an alarm signal. Motivation due to lack of time it considered to be not justified as it follows ,,a study conducted on 460 students has concluded that:
• 63% spend more than 6 hours in front of a computer;
• 96% spend 1-3 hours daily on the Internet;
• 94% consider surfing the internet a method of relaxation" [11]

The question is what will motivate them to do physical activity after the second year of study, when the physical education classes will be no longer compulsory,. ,,Research on the value of sports exercises as prophylactic means is as numerous as those in the therapeutic field - for recovery. We know that health education, in the prophylactic sense, is not just a medical task; it must be achieved through a comprehensive influence" [12]

Lack of physical activity can be linked to static vertebral disorders and weight problems. Hypotonia of paravertebral muscles results in the lack of correct body alignment. ,,These bad habits are caused largely by sedentary life, characteristic of contemporary society and the activities we have learned since childhood, such as writing, which requires intense neuromuscular effort lead to adoption of very tense positions."[14] Physical inactivity is a health risk behaviour which leads to weight problems. ,,Adults should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity''. [14]

Conclussion

The reasons for the occurrence of these conditions in such a large proportion can be related to the following:

- Students are less interested in movement and sport, spending a lot of time in front of the computer.
- Most students practice physical exercise only once a week only during physical education class.
- The study has provided that little or no physical activity is related to the risk of develop a vicious body posture.
- Spinal disorders and back pains can have a profound effect on a person's overall health, sometimes preventing them from working or even doing simple daily activities.
- Physical inactivity is a health risk behaviour which leads to weight problems.

References

[1] MIHĂILĂ Roxana (2013) *Pilot Study On Monitoring Static And Dynamic Vertebral Disorders In Children Of School Age* in Revista De Cercetare Şi Intervenţie Socială, 2013, tom. 43, pp. 100-114, www.rcis.ro, www.doaj.org

[2] NETER, F. H. (2010). *Atlas of Human Anatomy*. 5th Edition, Newark, Profesional Publisher.

[3] BURCEA Claudia (2010) *The Role Of Physical Therapy In Balancing The Scoliotic Spine,* in Revista Română De Kinetoterapie, tom. 25/ 2010, pp. 45-51

[4] Genetics Home Reference (?) Adolescent idiopathic scoliosis
https://ghr.nlm.nih.gov/condition/adolescent-idiopathic-scoliosis

[5] CAVANILLES-WALKER J.M., BALLESTERO C., IBORRA M., UBIERNA M.T.,TOMASI S.O. (2014). *Adult Spinal Deformity*: Sagittal Imbalance in International   Journal of Orthopaedics

[6] PRICE, J. (2015) *Excessive Thoracic Kyphosis: More Than Just Bad Posture*, on www.ideafit.com/fitness-library, https://www.ideafit.com/fitness-library/excessive-thoracic-kyphosis-much-more-than-just-bad-posture-0

[7] CACIULAN Elena, STANCA Daniela, MARIN Dana (2011) *Study On The Fed Method Application In Thoraco-Lumbar Scoliosis* in Revista Română De Kinetoterapie, tom. 17/ nr. 28/ 2011, pp.10-18

[8] World Health Organization 2006 *BMI classification*
http://apps.who.int/bmi/index.jsp?introPage=intro_3.html

[9] Vinodviplav (2016) *Spinal disorders can be caused by posture, excessive weight and lack of physical activity* on healthspectrum.org , http://healthspectrum.org/spinal-disorders

[10] PELTZER, K., PENGPID S., T. SAMUELS, A., ÖZCAN,N. MANTILLA, C., RAHAMEFY,O., H., WONG, M., L., Gasparishvili, A.(2014) *Prevalence of Overweight/Obesity and Its Associated Factors among University Students from 22 Countries* in International Journal of Environmental Research and Public Health, 11(7), july 2014, pp: 7425–7441,
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4113885/

11] VOINEA Andreea (2016*) Impact of excessive computer use on global health state,* in Marathon, tom 8, Nr.2, 2016, pg 273-278

[12] DOMINTEANU Teodora (2010) *Adaptarea Înotului În Terapia Deficienţelor Fizice*, publicată in: Sesiunea internaţională de comunicări ştiinţifice: ”PROMOVAREA SPORTULUI ŞI EDUCAŢIEI FIZICE CA PARTE INTEGRANTĂ ÎN FORMAREA TINERILOR”, April 23th 2010, Bucharest, Romania. pp. 316-319

[13] SMÎDU NELUTA (2008) *Alexander Method-A Way to use kinesthesia in order to become conscious of our body* , The International Communication Session "European News and Trends in Physical Education and Sports" ASE Bucharest

[14] World Health Organization (2010) *Global Recommendations on Physical Activity for Health.,* Geneva, www.ncbi.nlm.nih.gov/books/NBK305058/

/