DIFFERENCES IN SPINE DEFORMITIES, VISCERAL FAT AND MOTOR ABILITIES BETWEEN ACTIVE AND INACTIVE STUDENTS

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ABSTRACT

The aim of this study was to evaluate differences in the prevalence of spinal deformities, body mass index (BMI), waist circumference (WC), explosive power and flexibility between students who are systematically involved in physically activities and inactive students. This study included 74 male students aged 19-23, divided into two groups. Group A consisted of 34 students that are involved in programmed physical activity at least 3 times a week, while Group B consisted of 40 inactive students. Assessment of spine status is done by physician, BMI was the body mass (kg)/height (m)^2 ratio, while the WC was a waist circumference measure. Motor abilities tests were: standing medicine ball throw (4kg), standing long jump and sit and reach test. Statistical analysis is done by SPSS program. Active students had less spine deformities than inactive students ($p<0.05$), lower WC ($p<0.05$), and greater results in throwing a medicine ball and long jump from standing position ($p<0.05$), while there was no significant difference in BMI ($p=0.13$) and in results of sit and reach test ($p=0.09$). The results of this study indicate that programmed physical activities have positive impact on spine postural status, smaller amount of WC as a measure of visceral fat and on development of explosive power in students.

Key words: deformities, explosive power, BMI

INTRODUCTION

Physical activity is important for health, and has many health benefits, between them are weight control and maintenance[1] and reduction of cardiovascular risks[2]. Moreover, cohort studies have evidenced that physical inactivity during childhood and/or adolescence tends to continue into adulthood, becoming difficult to change[3] Health-enhancing physical activity is that which benefits health and functional capacities without harm or risk. This term includes the full range of human movement, such as competitive sports and exercise, active hobbies, cycling or the physical activities of daily living[4]. Properly programmed physical activity has positive effect on motor abilities, such as flexibility and power. Adequate flexibility subjects have less injury risk than poor flexibility subjects, and excellent flexibility subjects may have dramatically less injury risk than poor flexibility subjects[5]. Adequate flexibility increases quality of life[6] and stretching is recommended for most populations. At the same time, physical activity strengthens paravertebral muscles and muscles of the hips and pelvis influencing postural status, especially spine postural status. The correct spine posture has a very important role in the motor ability, quality of life and aesthetics of a human being[7]. Besides idiopathic deformities, whose causes are still not the clearest, a big percentage of spine deformities are caused by the modern way of life, i.e. malnutrition, inactivity and obesity[8].

Thus, the aim of this study was to evaluate differences in the prevalence of spinal deformities, body mass index (BMI), waist circumference (WC), explosive power and flexibility between students who are systematically involved in physically activities and inactive students.

METHODS

Subjects

This study included total of 74 male subjects, they were all university students aged 19 to 23 years. They were divided into two groups depending on whether they are engaged in systematic physical activity or not. Group A consisted of 34 students that are involved in programmed physical activities at least 3 times a week, including criteria in the study was that they are consistently involved in physical activities for at least 12 months. Programmed physical activity consisted of 3 obligated classes during the week, from different fields in physical activities. On the first class in the week, students trained swimming, on the second class martial arts, and on the third class students had free sport activities with a ball (basketball, volleyball, handball, football, etc.). Group B consisted of 40 inactive male subjects, including criteria beside the age range from 19 to 23 years, were that they are not included in any programmed physical activity for last 12 months.

Tests and testing procedure

The status of the spine was determined by visual assessment method by physician, from front, side and rear side of the body[9]. The deviation from the normal status of spinal posture was reflected in the leaning posture of the head to one side, asymmetry of the chest, increasing the normal physiological spinal curves, asymmetric position of the shoulder and shoulder blades, Lorentz triangle imparity and asymmetry of the pelvic bone position. Body Mass Index (BMI) was **calculated** by taking a subject's weight and dividing by their height squared (kg / m^2 ratio), while the waist circumference (WC) was measured with meter ribbon. From motor abilities we tested explosive power and flexibility. For assessment of explosive power abilities, we used two tests: standing medicine ball throwing from chest test (4kg) and standing long jump test. Flexibility was assessed with sit and reach test.

Subjects were tested at least 48 hours after last activity and 2 hours after last meal. First their height and weight, and WC were measured, after that their spine postural status were examined by physician. On the last, their motor abilities were tested in the following order: 1. medicine ball throwing test, 2. standing long jump test and 3. sit and reach test. They had 3 trials in each test, with 2 minutes break between trials, best result from each trial was recorded. After they finish one test, they went to next one. Measurer didn't know who of the subjects is involved in systematic physical activities, and who is inactive.

Statistical analysis

Statistical analysis was performed by using the statistical package SPSS 18. Statistical analysis involved Chi-square test for assessment the significance of differences in prevalence of spine deformities between active and inactive students. For assessment the difference of BMI, WC and motor abilities between those two groups we used Independent Samples 'T' test, p value vas set on < 0.05.

RESULTS

Results shows that students included in regular physical activities have significantly less spine deformities than inactive students $p=0.027$. Better spine posture in active students is determined with significantly less number of kyphosis then in inactive subjects, while there was no registered scoliosis, nor lumbar lordosis in studied subjects. In our study, active subjects have also significantly lower waist circumference $p=0.039$ than inactive subjects. In contrast to spine deformities and waist circumference, there was no significant difference in BMI, $p=0.13$.

Results of motor abilities testing showed that active students have better developed explosive power, but that there was no statistically significant difference in sit and reach flexibility test (p=0.09). In both explosive power tests, medicine ball throwing test and standing long jump test, active students have significantly better results, p=0.041 and p=0.045, respectively.

DISCUSSION

In our study, from spine postural deformities, there was present only kyphosis, it was present in both active and inactive students, but active students had significantly less prevalence of that deformity. If we take into consideration, that programmed physical activity of active students consisted of swimming, martial arts and sports games with ball, it can explain this significance. Other researchers also found that swimming[10] and martial arts[11] have positive effect on postural status, while modern way of life, which includes inactivity is one of main causes of bad spine posture[8]. In our study inactive students had significantly bigger WC, but there wasn't significant difference in BMI. Although WC and BMI, are data that are dependent from other factors such as somatotype, we can say that significantly bigger WC in inactive students might be due to large amount of body fat, but that there isn't differences in BMI, because active students have bigger muscle mass. As these data, the percentage of body fat and muscle mass, are not directly measured, further studies are needed. Other researchers agree that physical activity lowers body fat and increases muscle mass, especially in martial arts which are mainly weight classified sports, in which body fat is discriminator factor for success[12]. Explosive power is motor ability which is crucial in martial arts[13], and it is also very important factor in swimming and sport games, which is confirmed by other researchers[14], and which supports the statistical significance that we found. Although these types of activities also have positive effect on flexibility, in our study we didn't find statistical significant difference between active and inactive students.

CONCLUSION

The results of this study indicate that programmed physical activities have positive impact on spine postural status, smaller amount of WC as a measure of visceral fat and on development of explosive power in students.

REFERENCES

Shepard RJ. Physical activity, fitness and health: the current consensus. *Quest* 1995; 47: 288-303.

Blair SN, Brodney S. Effects of physical inactivity and obesity on morbidity and mortality: current evidence and research issues. *Med Sci Sports Exerc* 1999; 31(Suppl.): S646-62.

Aarnio M, Winter T, Peltonen J, Kujala UM, Kaprio J. Stability of leisure-time physical activity during adolescence - a longitudinal study among 16-, 17- and 18-year-old Finnish youth. *Scand J Med Sci Sports* 2002; 12: 179-85.

Guidelines for health-enhancing physical activity promotion programmes. Tampere, Finland, UKK Institute for Health Promotion Research, 2000.

Pope, RP, Herbert, RD, and Kirwan, JD. Effects of ankle dorsiflexion range and pre-exercise calf muscle stretching on injury risk in army recruits. *Aust J Physiother* 1998; 44: 165–177.

Araujo, CGS. Flexitest: An Innovative Flexibility Assessment Method. Champaign, IL: *Human Kinetics*, 2004.

Tones M, Moss N, Polly DW. A review of quality of life and psychosocial issues in scoliosis. *Spine* 2006; 31: 3027-38.

Ramova EP, Lazović M. Prevencija deformiteta kičme kod adolescenata zbog dugih prinudnih stavova. (in Serbian) Med Pregl 2010; 63: 855-58.

Pineda S, Bago J, Gilperez C, Climent JM. Validity of the Walter Reed Visual Assessment Scale to measure subjective perception of spine deformity in patients with idiopathic scoliosis. *Scoliosis* 2006, 1: 18.

Fajdasz A., K.Zatoń. The spinal column formation in young swimmers. (Engl. abstr.) *Pol. J. Sports Med*. 2000; 16: 23-26.

Sikorski W, Blach W. Judo for health. *Journal of Combat Sports and Martial Arts* 2010; 2(2): 123-124.

Ali PN, Hanachi P, Nejad NR. The Relation of Body Fats, Anthropometric Factor and Physiological Functions of Iranian Female National Judo Team. *Modern Appl Sci* 2010; 4: 25-29.

Isao N. Best judo. *Kodansha International Ltd*, Japan 1991; 210- 26.

Robert U. Newton, Julian Jones, William J. Kraemer, Harry Wardle. Strength and Power Training of Australian Olympic Swimmers. *Strength and Conditioning Journal* 2002; 24 (3): 7–15.