STUDIA UNIVERSITATIS
BABEŞ-BOLYAI

EDUCATIO ARTIS GYMNASTICAE

2/2019

STUDIA
UNIVERSITATIS BABEŞ-BOLYAI
EDUCATIO ARTIS GYMNASTICAE

2/2019

DOI:10.24193/subbeag.64(2)

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STUDIA UNIVERSITATIS BABEŞ-BOLYAI EDUCATIO ARTIS GYMNASTICAE

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YEAR **Volume 64 (LXIV) 2019**
MONTH **JUNE**
ISSUE **2**

S T U D I A

UNIVERSITATIS BABEŞ-BOLYAI

EDUCATIO ARTIS GYMNASTICAE

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STUDIA UBB EDITORIAL OFFICE: B.P. Hasdeu no. 51, 400371 Cluj-Napoca, Romania, Phone + 40 264 405352

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(RECOMMENDED CITATION)
DOI:10.24193/subbeag.64(2).10

STUDY SUCCES AS A FUNCTION OF OUT-OF-SCHOOL SPORTS ACTIVITIES (Based on OKM 2016 database)

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ABSTRACT. Study success is usually closely related to the popularity of certain subjects and the sport activities. The purpose of our study is to highlight the connection between the participation of students in out-of-school sports activities and their success in school on the basis of the analysis of the 10th-year student questionnaires of the 2016 OKM database. In our research we examine the correlation between sport activities and gender using cross tables. For forming student groups, we used cluster analysis, for analysing the factors of participation in extracurricular sport classes we used logistic regression analysis, and for analysing the factors influencing grade point average we used linear regression analysis. As for out-of-school extra and private lessons, according to our results sports activities seem to be the most popular with students. Concerning gender and school grade average, boys and students with a better school grade average take part in sports activities unlike girls and students with lower school grade average. Regression results have shown that boys, those living in the city, the more financially well-off, the highly educated and the labour-marketed parents, those attending grammar school, and pupils in church-based institutions attend extra-curricular sports classes. There is also a strong correlation between the average education and non-school sports, as students with a higher average grade are involved in separate sports classes.

Keywords: *success in school, out-of-school sports activities, national competence survey*

Introduction

Nowadays, the value world of young people other than adults is clearly centred on experience, postmodern values. From the field of professional sports, young people are moving towards a free sports experience. (Bodnár

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and Perényi 2016). Young people are formed into an independent social community. Their cultural and leisure time habits and their daily activities are completely different from any other social group. Sport, as an active form of leisure, plays a decisive role in young people's lives. Teaching and learning environments play an important role in defining performance concepts, which include not only formal and non-formal learning processes, but also social and organizational contexts (Pusztai, 2016). The effectiveness of sporting activities and the positive effects of sports have been studied by many. Ács et al. (2011) described the social expectation of sport as a process of consolidating health, serving physical, mental and spiritual development. Csányi and Révész (2015) also formulate the goal of increasing the effectiveness of learning in other subjects. According to research results (Perényi 2011, 2014; Hamar 2012; Kovács 2016) sport is more common among boys than girls. Hamar and Karsai (2008) examined the affinity of physical education for 11-18 year old students (N = 2840) in cross-sectional arrangement. Based on this, boys have a more accepting attitude than girls, and the positive emotional saturation is greatly reduced among girls, with age. The links between earlier research are unclear concerning the relationship between sport and effectiveness (mainly in upper secondary and higher education): some studies resulted in positive effects of sport (Castelli et al. 2007) and others negative (Maloney-McCormick, 1993) while some studies have not found any correlation between these two variables (Fisher et al. 1996). Shephard and Trudeau (2013) examined the studies on the relationship between sport and learning performance, and they showed more positive correlations than negative or neutral. It was concluded that programs related mainly to physical activity in primary school only make a small contribution to better test results, but greatly improved classroom performance through a positive impact on cognitive functions. Our research topic has not been studied from the OKM database before, so we hope to provide a snapshot of the connections between the sporting activity and the learning outcomes of today's high school generation.

Hypotheses

Hypothesis 1: Out-of-school sports activities are popular among students (Fintor, 2016).

Hypothesis 2: Boys do more sports than girls (Perényi, 2011, 2014; Hamar, 2012; Kovács, 2016). We assume that boys are primarily involved in out-of-school sports. (Hamar and Karsai, 2008)

Hypothesis 3: Athletes have better study results than those who do not do any sports (Kovács, 2015; Kovács, 2018). We assume that those who do sports out of an educational institution have better school results.

Hypothesis 4: We assume that athletes prefer primarily human and science subjects, rather than art subjects (such as music or drawings). Those who like art subjects take part in extracurricular sport activities in a lower rate.

Hypothesis 5: We assume that socio-demographic background variables, the type of school, and the maintainer influence the participation in sporting activities beyond school. We assume that those who do sports out of school have a better socio-demographic background, so their parents' qualification is higher, their parents are active in the labour market, the family is in a better financial position, live in a city, and students go to high school and study in a church-maintained institution.

Hypothesis 6: We assume that the school results are influenced positively by not just socio-demographic background variables, the type of the school and the type of maintainer, but the sport activity done out of school. Shephard et al. (2013) in a five-year longitudinal study showed that the group that had five physical education lessons per week had better school performance than the control group who had just 40 minutes.

Materials and methods

Every year, every 6th, 8th and 10th year student of each institution participates in the National Competence Measure. This research is based on the analysis of the 10th grade student questionnaires of the OKM 2016 database. In this database we examined the popularity of extra-curricular classes outside school. Among the private lessons listed in the questionnaire, students nominated the highest proportion of sports activities. In our research, we use cross-table to examine the relationship between participation in sport and sex variable. In the study of sport in extracurricular lessons and gender relations, we sought the correlation between study success and participation in out-of-school sports activities using variance analysis. We examined what kind of subjects those students like the most who do sports. First we created cluster groups with cluster analysis based on what subjects students like, and then we used cross-tables to examine the relationships between sports and cluster groups. With logistic regression model, we examined what variables

affect participation in out-of-school sport activities. Finally, with a linear regression model, we analysed whether the student's school results are influenced by out-of-school sport activities besides the socio-demographic variables.

Results

Our first hypothesis examined participation in sports, the aggregation of which is illustrated in Figure 1.

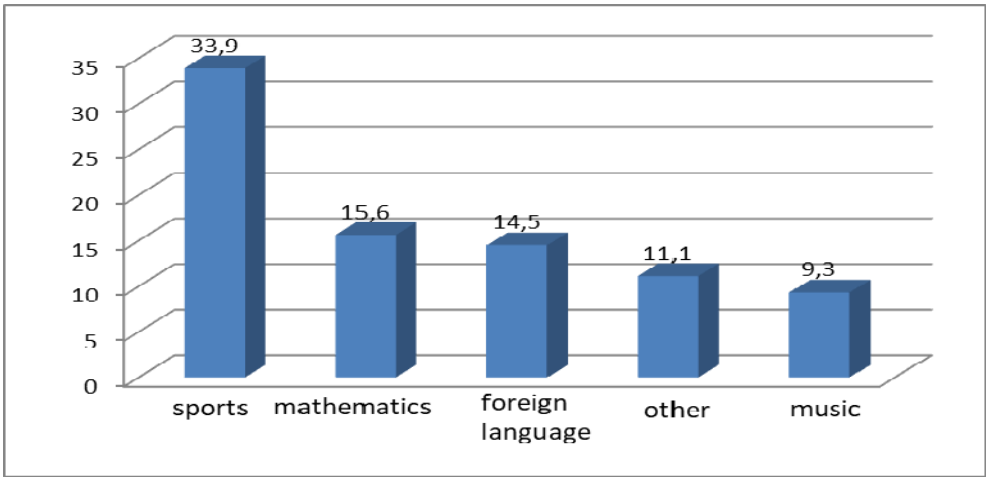

Figure 1. Participation in extracurricular and private lessons (%) (OKM 2016, N=88382)

It can be seen from Figure 1 that students take the highest proportion of sports from extracurricular lessons listed in the questionnaire. What exactly these sport activities are (competition sports, hobby sports, etc.) and the frequency with which the student participates is not answered by the database. However, sport is definitely the most popular followed by mathematics (15.6%), foreign language (14.5%), other special classes (11.1%) and music classes (9.3%). Therefore, our hypothesis has proved that in the case of extra-curricular classes and private lessons, sporting activities seem to be the most popular among students.

In our second hypothesis, we assumed that boys were the main participants in out-of-school sport activities. In the following, we will use the cross-table to examine the relationship between participation in sport and sex.

Table 1. Participation in out-of-school sports activities by gender (OKM 2016, N=69890) (p=0.000)

Sex		Do not take part in extracurricular sport activity	Take part in extracurricular sport activity
Male	%	46.8	53.9
	item number	21630	12776
Female	%	53.2	46.1
	item number	24563	10921
All	%	100	100
	item number	46193	23697

Table 1 shows that there is a significant correlation between gender and participation in sport activities. 53.9% of those in sports are boys and 46.1% are girls, while of those who do not attend out-of-school sports 46.8% are boys and 53.2% are girls.

Our hypothesis that boys are primarily involved in out-of-school sports has been confirmed. Our research data confirm previous studies (Perényi 2011; 2013; Hamar 2012; Kovács 2016). In terms of gender, boys continue to favour sporting activities for extracurricular activities.

In the study of sport lessons and gender relations, we examined the relationship between academic success and participation in out-of-school sports (Table 2).

Table 2. Correlation of participation in out-of-school sports activities and the grade point average (OKM 2016, N=58292) (p=0.000)

		Grade point average of the last year
Took part in sport activity	Average	4.173
	Item number	20407
Did not take part in sport activity	Average	3.917
	Item number	37949
All	Average	4.007
	Item number	58356
Anova		0.000

In our third hypothesis we assumed that students who do sports beyond the walls of an educational institution have better academic results.

Based on the results of the analysis of variance, a significant correlation can be found between participation in out-of-school sports and the grade

point average at the end of the previous year (p = 0.000). The data show that students who do sports out of the school have a better grade point average than their non-athlete mates. The interviewed students reported a grade point average of 4.0 on average. Those who do sports on extracurricular lessons had an average of 4.1, while non-athletes achieved 3.9 at the end of last year. Our third hypothesis has also been confirmed that athletes have better study results than non-athletes. Our present research reinforces the results of studies showing that sport has a positive impact on the relationship between sport and success (Castelli et al. 2007, Shephard and Trudeau 2013).

Since the National Competence Measurement Student Questionnaire does not ask the subject of physical education in relation to the popularity of subjects, we do not have any data that would show the popularity of physical education. However, we can look at what kind of subjects those students like the most who do sports. To do this, we first create cluster groups with cluster analysis based on what subjects students like and what student groups we can create, and then use cross-tables to examine the relationships between sports and cluster groups.

During cluster analysis, cluster groups were created based on the 11 subjects listed in the OKM questionnaire (Table 3).

Table 3. Popularity of subjects in cluster groups (N=64505)
We highlighted those above 3.5.

	Those who like graduation subjects	Those who like all subjects	Those who mostly like art subjects
Hungarian language	2.97	3.69	2.96
Literature	3.26	4.04	3.31
Mathematics	3.52	3.53	2.29
History	3.65	3.97	3.00
Biology	3.37	3.98	3.08
Chemistry	3.02	3.50	2.16
Physics	3.41	3.50	2.17
Geography	3.18	3.75	2.76
Music	2.53	4.05	3.39
Art	2.94	4.29	3.77
Foreign language	3.75	4.08	3.13
All	17494	25685	21326

Source: OKM 2016

We have created three cluster groups based on popularity: those who like graduation subjects, those who like every subject, and those who like art subjects.

Those who like graduation subjects: this group includes students who have firstly declared their compulsory maturity subjects (mathematics, history, foreign language) that they like. A total of 17,494 students belong to this group.

Those who like all subjects: this group includes students who were positive about every subject. A total of 25,685 students belong to this group.

Group of art lovers: This group includes students who prefer the art subject, but not as much as members of a the group who like all subjects. On the whole, none of the subjects were declared as positive as members of the other groups. A total of 21,326 students make up this group.

The relationship between cluster groups and participation in out-of-school sports activities is discussed in Table 4 below.

Table 4. Examination of correlation between participation in out-of-school sports activities and cluster groups (N = 63428) (p = 0.000)

Does he/she do sports out of school?		Those who like graduation subjects	Those who like all subjects	Those who love art subjects
Do not do sports	%	61.0	65.7	70.6
	Item number	10497	16606	14783
Do sports	%	39.0	34.3	29.4
	Item number	6721	8679	6142
All	%	100	100	100
	Item number	17218	25285	20925

Source: OKM 2016

Table 4 shows that there is a significant correlation between participation in out-of-school sports activities and cluster groups (p = 0.000).

In our fourth hypothesis we assumed that athletes prefer primarily humanities and science subjects, rather than art subjects, and those who like art subjects attend out-of-school sport classes less.

On the whole, it can be seen that the proportion of those who do not sport outside school is higher in each cluster groups than the proportion of athletes. There is the highest proportion of athletes among those who like graduation subjects (39%), 34.3% among those who like all subjects, and only 29.4% of those who love art subjects admit to do sports out of the school.

Our fourth hypothesis has been confirmed that those who like art subjects do less extracurricular sport activities.

In the following, we use a logistic regression model to examine the effects of variables on participation in out-of-school sports (Table 5). In order to monitor the interaction effect, we included the variables in three steps.

Table 5. Logistic regression models for out-of-school sport activities (N=89516)

Explanatory variable	Exp(B)	Exp(B)	Exp(B)
Sex	1.340***	1.332***	1.344***
Type of settlement	1.782***	1.326** *	1.263***
Financial background		1.538***	1.498***
Qualification of mother		1.565***	1.526***
Qualification of father		1.512***	1.462***
Mother works		1.148***	1.144***
Father works		1.186***	1.182***
Type of school			1.634***
Type of maintainer			1.634*
RL2=	1.37	5.32	5.69

Source: OKM 2016

In the first step we included the sex (0 = girl, 1 = boy) variable and the settlement type variable (0 = village, 1 = city). It can be seen that boys and city dwellers are significantly more involved in out-of-school sports.

In the second step, besides the gender and the type of settlement we included the variables concerning objective financial situation[2] (0 = low 1 = high), the parents' qualification (0 = low, 1 = high) and the parents' labour status (0 = not working, 1 = working). The table shows that after the inclusion of these latter variables, the explanatory power of gender and settlement type has decreased. The financial situation, the educational attainment of parents and the status of the labour market have a significant impact on participation in sports activities. It can be seen that a better financial situation, mother and father's

[2] We measured the objective financial situation with the following items: if there are minimum 2 pieces: mobile phone, computer, car, bathroom, internet connection.

higher qualifications, and the active labour market status of mother and father have a positive impact on participation in out-of-school sports activities.

In the third step, the type of school (0 = non-grammar school, 1 = grammar school) and the type of maintainer (0 = non-church, 1 = church) were included. It can be seen that mainly students attending grammar school and those with church maintenance are involved in sports activities.

Our hypothesis has been confirmed that those who do sports outside the school have a better socio-demographic background, their parents have higher qualification, their parents are active in the labour market, the family is in a better financial position, live in a city, students go to high school and study in a church-maintained institution.

Although we have previously investigated the significant correlation between the grade point average and participation in out-of-school sports, with the help of a linear regression model we will now examine, whether the student's out of school activities have an effect on school performance beyond socio-demographic variables (Table 6).

Table 6. Linear regression models for the grade point average (N=88382)

Explanatory variable	B	Std. Mistake	Beta	Significance
Constant	3.476	0.011		0.000
Extracurricular sport	0.092	0.006	0.059	0.000
Sex	-0.315	0.006	-0.210	0.000
Type of settlement	-0.020	0.007	-0.012	0.003
Qualification of mother	0.407	0.007	0.264	0.000
Qualification of father	0.271	0.007	0.181	0.000
Mother works	0.121	0.008	0.061	0.000
Father works	0.167	0.010	0.067	0.000
Financial background	0.116	0.006	0.073	0.000
Type of school	0.051	0.009	0.021	0.000
Type of maintainer	0.035	0.008	0.017	0.000

Source: OKM 2016

In the linear regression study the following variables were included in addition to the grade point average: gender, type of settlement, parents' qualification, parents' labour status, objective financial situation, type of school, and school maintainer. The results show that the grade point average is influenced by whether the student attends extracurricular sports activity ($p = 0.000$), the gender of the student ($p = 0.000$), the type of settlement where they live ($p = 0.003$), the mother's qualification ($p = 0.000$), the father's qualification ($p = 0.000$), the mother's labour market status ($p = 0.000$), the father's labour

market status (p = 0.000), the objective financial situation of the family (p = 0.000) the type of school (p = 0.000) and the school's maintainer (p = 0.000). The table shows that those students have higher grade point averages who attend out-of-school sport activities, girls, who live in small settlements or villages, whose parents have higher qualification, whose parents are employed in the labour market, who have high objective financial status, who go to high school and church-maintained schools.

Our hypothesis has been confirmed that academic success is positively influenced by not just socio-demographic background variables, school type and maintainer, but also by out-of-school sports activities.

Discussion

The aim of the research was to investigate the relationship between participation in extracurricular activities and the school success based on OKM database by an unexplored aspect so far, especially with regard to out-of-school sports.

It can be stated that out-of-school sports classes and private lessons are very popular among students. In terms of gender and grade point average, it can be seen that boys and those with a better grade point average are more involved in sport activities than girls and undergraduates. There is also a strong correlation between the grade point average and out-of-school sports, as students with a higher grade point average attend extracurricular sports classes. Regression results showed that boys, those living in the city, those with better financial background, children of high-educated and working parents, those attending high school, and pupils in a church-maintained institution attend extra-curricular sports classes. The results of the linear regression study show that the study success is also positively influenced by sport activities, besides the socio-demographic background variables, the school type and the maintainer.

Based on her research Klára Kovács states that the validity of the development model and Coleman's social capital theory for leisure-time athletes has been clearly demonstrated, primarily due to the personality development and social character of sports. The results that sport has a positive effect on learning outcomes are consistent with the earlier results of Hartman (2008), Castelli et al. (2007), Miller et al. (2007). According to Trudeu and Sephard (2008), sporting in leisure time or as an extracurricular program enhances school attachment, gives confidence, and plays an important role in learning success.

Conclusion

The results show correlation between sport and subject popularity, which can be a base of further researches. Considering individual and institutional characteristics in supporting extracurricular sport activities is essential. The positive effect of out-of-school sport classes on study success is worth using also in practice.

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STUDIA UBB EDUCATIO ARTIS GYMN., LXIV, 2, 2019, pp. 17 - 26
(RECOMMENDED CITATION)
DOI:10.24193/subbeag.64(2).11

MOTIVATIONAL MANAGEMENT IN SPORTS ORGANIZATIONS

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ABSTRACT. Motivation is a major component of management and one of the most frequently discussed topics in literature. The issue of the psychological training of athletes as part of the training is of great interest, especially nowadays that the sporting results are extremely high. In tackling this topic, we started from the assumption that motivation is the process governing the choices made by each athlete to achieve sporting performances. This study studied the identifying of the main motivational factors that make athletes perform high-performance sport, with regard to athletes from for sports clubs ACS-U BancaTransilvania and CS Universitatea, both from Cluj-Napoca. The purpose of the research was based on a questionnaire, applied in the middle of the 2018-2019 competitive season, on a sample of 35 subjects, on 12 December 2018, having the opportunity to analyze the reasons for practicing basketball, completed with a comparison and hierarchy of the reasons for practicing basketball among athletes involved in a junior league and athletes participating in a superior league. Our study has shown that athletes who do not practice performance sports in the National League, i.e. the components of the ACS U-BT Cluj-Napoca team, are mainly motivated extrinsic by the need for status acknowledgement, while among athletes from CS Universitatea the hierarchy of reasons for basketball participation is different, with an emphasis on intrinsic motivation - or orientation towards task in achieving the goal.

Keywords: *management, extrinsic motivation, intrinsic motivation, sports performance, basketball.*

REZUMAT. ***Managementul motivator în cadrul organizaţiilor sportive.*** Motivarea reprezintă o componentă majoră a managementului şi un subiect dintre cele mai frecvent tratate în literatura de specialitate. Problema pregătirii psihologice a sportivilor ca parte a instruirii este de mare interes, mai ales acum când rezultatele sportive sunt extrem de ridicate. În abordarea acestei teme, am pornit de la premisa că motivaţia este procesul care guvernează alegerile făcute de fiecare sportiv pentru a realiza performanţe sportive. În cadrul acestei lucrări s-a studiat identificarea principalilor factorilor motivaţionali

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care îi determină pe sportivi să practice sportul la nivel de înaltă performanţă, în ceea ce privește sportivii cluburilor ACS-U Banca Transilvania și CS Universitatea, ambele din Cluj-Napoca. Scopul cercetării a fost realizat pe baza unui chestionar, aplicat la mijlocul sezonului competiţional 2018-2019, pe un eșantion de 35 de subiecți, la data de 12.12.2018, având posibilitatea de a analiza motivele practicării jocului de baschet, finalizându-se cu o comparație și ierarhizare a motivelor practicării baschetului între sportivii angrenați într-o ligă de juniori și sportivii participanţi într-o ligă superioară. Studiul nostru a arătat că sportivii care nu practică sportul de performanță în Liga Națională, aici vorbind despre componenții echipei ACS U-BT Cluj-Napoca, sunt în principal motivați extrinsec, de nevoia de recunoaștere a statusului, în timp ce în rândul sportivilor de la CS Universitatea ierarhia motivelor care determină participarea la baschet este diferită, cu accent pe motivația intrinsecă – sau orientarea spre sarcină în atingerea scopului.

Cuvinte cheie: *management, motivație extrinsecă, motivație intrinsecă, performanță sportivă, baschet.*

Introduction

The issue of the psychological training of athletes as part of the training is of great interest, especially when sports results are extremely high, according to the authors Epuran, Holdevici and Tonița (2008), the psychological training of the athlete involves all the strategies and techniques used in training and education, to increase the mental capacity and the development of the athlete's personality, corresponding to the requirements of an event / sport, to achieve results and a higher level of training and competition.

The concept of motivation only emerged in the twentieth century. The complexity of the concept of motivation as a psychological phenomenon has determined the interest of researchers in psychology. According to Mihăilescu, Haralambrie, Mihăilescu, Mihăilescu (2011): Motivation is expressed by a certain tense mental state based on the correlation between perception and thinking, and the foundation of the motivation is represented by the totality of sports performance needs and interests, and motivation determines focus, will and vigorously support training and participation efforts in competitions. Factors that help to determine satisfaction are called motivating factors, while factors that lead to dissatisfaction are called hygiene factors (Duică, 2008).

From the managerial conception standpoint on which it is based, Nicolescu and Verboncu (1999) present two major concepts of motivation:

Motivation in a narrow sense, based on a classic vision of organization and management, which only targets employees or staff of the organization.

Motivation in a comprehensive sense, outlined in recent years, based on a modern vision of organization and management. Its key feature is focusing on the stakeholders, i.e. those people who have major interests in the organization's development and performance. The main stakeholders usually aimed are: Owners, customers, managers, employees.

In sports, the motivation of the athlete can be the key to success. Various external influences that have an effect on the sports career, the coach - athlete relationship is one of the most important influences on athletes' motivation and performance, as Mageau and Vallerand (2003) specify in their study of the relationship between coach and athlete. In many ways, the coach plays an important role in education, meeting the emotional and physical needs of athletes. The environment driven by the coach, whether critical or motivating, affects the athlete's psychosocial well-being. Research on the environment, Reinboth and Duda (2004) delineate two types: Task-oriented and ego-oriented environments. A task-oriented environment encourages mission leadership, skills development and knowledge acquisition, while ego-oriented environment focuses on individual performance and effort towards other competitors.

Objectives

The objective of the study is to compare the results of a questionnaire on the level of motivation in practicing basketball between a junior team and one participating in the National Basketball League. At the same time, it is also aimed at the detailedanalysis of the motivational factors with the greatest impact on practicing basketball and the type of motivation (intrinsic / extrinsic) that characterizes the groups.

Material and Methods

This study was conducted in the middle of the 2018-2019 competition year, precisely on 12 December 2018, applying a questionnaire to a sample of 35 athletes, male, aged 18-20 years. The sample studied consists of 20 athletes of ACS-U BancaTransilvania Cluj-Napoca Club (hereinafter referred to as ACS U-BT) and 15 athletes of CS Universitatea Cluj-Napoca Club. It is worth mentioning that the athletes of the U-BT Club are engaged in the National Junior Championship, while the athletes of the Universitatea Club play at a higher level in the National Men's Basketball League of Romania.

The indispensable material for the social survey was the questionnaire on the reasons for practicing sport - PMQ30 - by Gill, Gross and Huddleston (1983).

The questionnaire contains 30 questions and refers to the reasons deemed motivational by sportsmen to practice basketball. For each question, subjects have to mention, by encircling the version that applies to them in the answer sheet, according to the following options:

3 - Not Important At All
2 - Of Little Importance
1 - Very Important

Each athlete who completed the questionnaire obtained a score. This score was obtained using the 3-point Lickert scale. For the answers marked as 'Very Important one point was assigned, for 'Of Little Importance' answers 0 points and for those marked with 'Not Important At All' - 1 point, thus obtaining a score for each athlete, to ultimately calculate the average. The 30 questions were divided into 6 groups as follows:

- In the Skills / Competence factor, the following questions were included: 1, 5, 10, 20, 23;
- The Status Recognition factor included the following questions: 3, 14, 21, 25, 28;
- The Energy Release factor included the following questions: 4, 13, 16, 19, 29;
- The Team Atmosphere factor included the following questions: 7, 8, 17, 18, 22;
- The Affiliation factor included the following questions: 2, 9, 11, 26, 27;
- The Fitness factor included the following questions: 6, 12, 15, 24, 30.

Results

The results are discussed starting with an overview of the data obtained at the level of the whole sample of athletes. Thus, Table 1 contains the average of the scores for participation in basketball training, organized by the factors identified by the authors of Gill et al. (1983).

At the level of the entire sample, the most important factors that ensure participation in basketball training are: Status Recognition (average = 3.51), Skills / Competition (average = 2.85) and Team Atmosphere factor (average = 2.65). Therefore, the desire to be loved and appreciated, the social factor involved in team play, together with the desire to develop skills and to compete are the main reasons for athletes to play basketball. These general results, however, have limited value due to the alleged differences between the hierarchy of the junior athletes and those at the national league level. Therefore, the results analysis is focused on the two groups of athletes separately.

Table 1. Average about the reasons for practicing basketball

Factors	Average
Skills / Competition	2.85
Status Recognition	3.51
Energy Release	1.28
Team Atmosphere	2.65
Affiliation	0.74
Fitness	1.88

It can be observed (see Graph 1) that the main reason that determines athletes to play basketball is different for the 2 teams. Thus, for the CS Universitatea Cluj-Napoca team, the athletes considered Skills / Competition the most important factor, and U-BT's athletes preferred the Status Recognition factor.

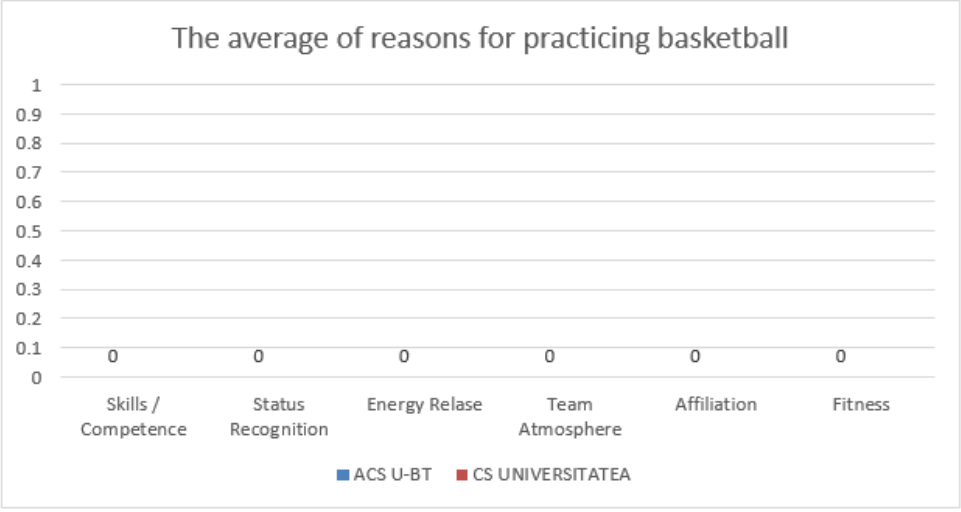

Fig. 1. The average of reasons for practicing basketball

An in-depth analysis of the reasons, carried out at the level of the two teams, confirms that in the case of high-performance sports, the reasons are complex, consisting of both task orientation and ego orientation. For those who do not practice performance sports at the level of the National League (U - BT Cluj), the only significant correlation occurs between the ego orientation and status recognition (Table 2). In other words, the motivational factor with the highest weight is the recognition of the status - derived from the extrinsic factor - the ego orientation.

Table 2. The correlation between the motivational factors and the orientation towards achieving the goal, for the U-BT team

Factors	Skills / Competition	Status Recognition	Energy Release	Team Atmosphere	Affiliation	Fitness
Task	0.096	0.061	-0.123	-0.128	0.328	0.383
Ego	0.148	0.159	-0.133	0.1	0.304	0.421

* Correlation is significant at level 0.01

The motivational configuration of athletes who are enrolled in a high-performance competition (CS UniversitateaCluj) is more complex, involving both factors pointing to task orientation as well as factors pointing the ego orientation (Table 3).

Table 3. The correlation between the motivational factors and the orientation towards achieving the goal, for the CS UniversitateaCluj team

Factors	Skills / Competition	Status Recognition	Energy Release	Team Atmosphere	Affiliation	Fitness
Task	0.184	0.210	0.201	0.119	0.473	0.249
Ego	0.178	0.487	0.202	0.216	0.107	0.635

Analyzing the first question, 'I'm physically active because: I want to improve e my skills', one can see in Chart 2 that professional players have a much higher propensity to improve their skills than juniors.

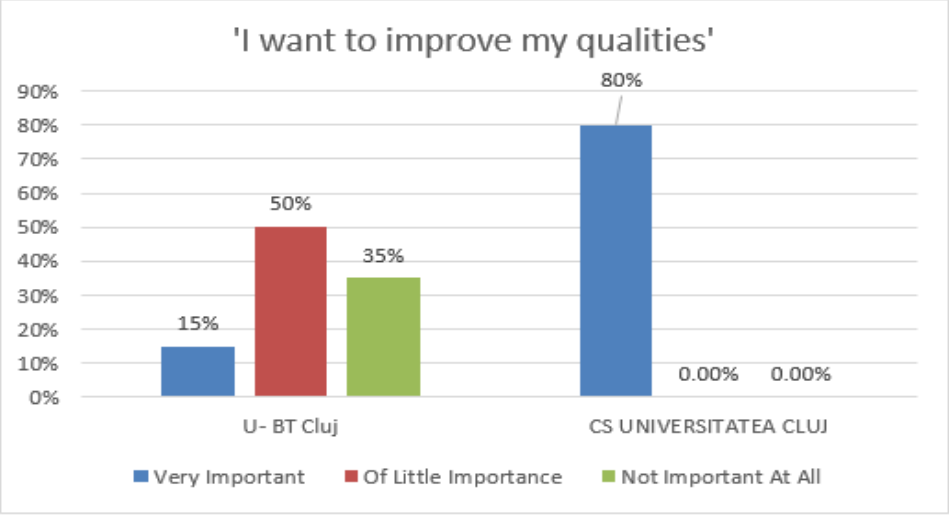

Fig.2. Comparison in terms of the desire to improve the qualities between the 2 teams

In relation to the Skills / Competence factor, question 10, 'I want to learn new skills', highlights the athletes in the professional league as being more open and motivated in terms of acquiring new procedures. Higher level motivates one to try to do one's best to become better, while at junior level, motivation is not so great, seeing basketball more like a play, a hobby.

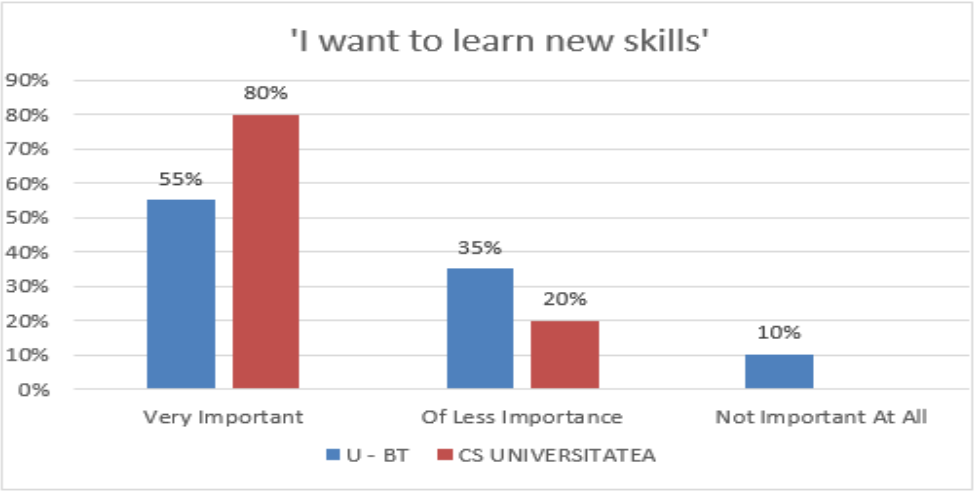

Fig. 3. Comparison answers to question 10

As regards the 'Fitness' factor, question 24 of the questionnaire, here the share is much higher for the CS UNIVERSITATEA team, so the desire to be in a good physical form is much higher.

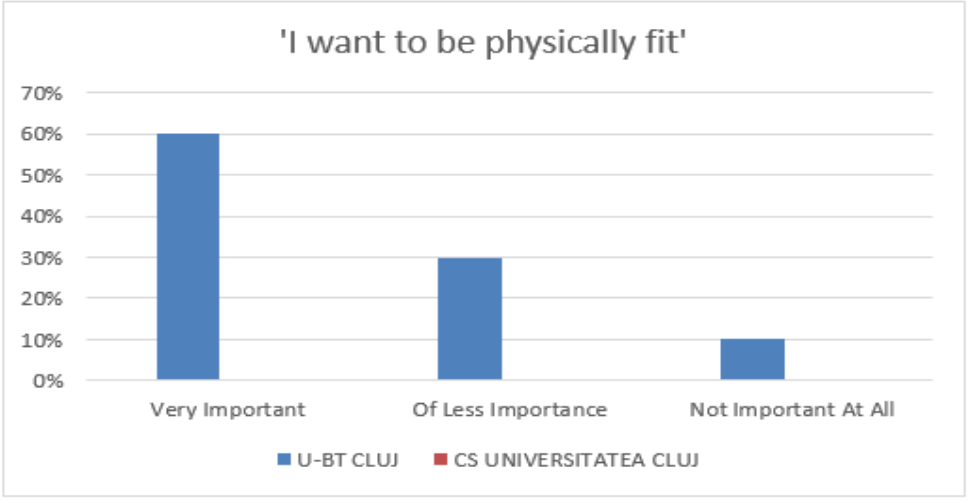

Fig. 4. Analysis of the results of question 24

The 'Status Recognition' factor is much higher among junior athletes. At question 3, 'I like to win', 90% of U-BT athletes responded that it is very important, while only 73.33% of UniversitateaCluj athletes considered this aspect very important.

This is pretty much the case with question 14, which also falls within the above-mentioned factor, winning prizes being more important for U-BT juniors than for professional league athletes. Around 90% of the U-BT team's members saw this as very important, while only 80% of the Universitatea team's athletes considered this very important, with 13.33% considering not so important and even 6.66% considering it not at all important.

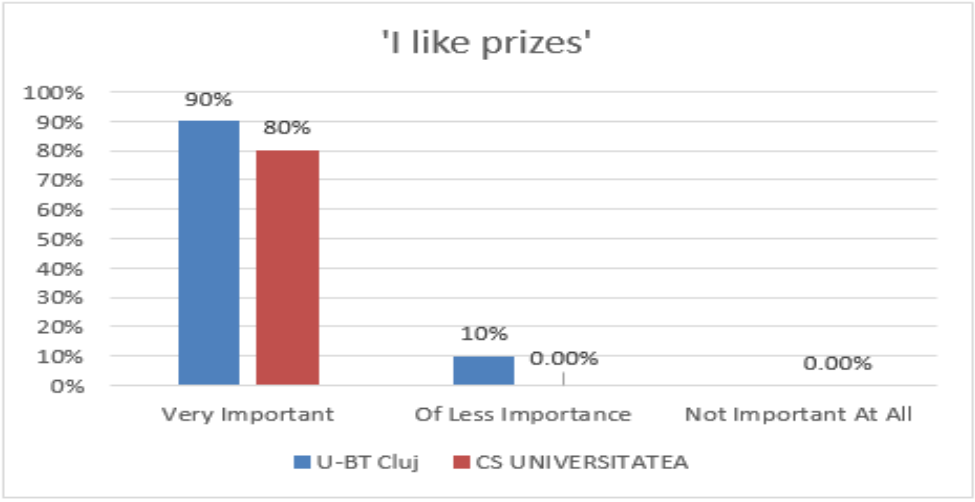

Fig.5. Comparison of answers for question 14

Finally, we present a general comparison of the averages in relation to the six factors mentioned above, representing the reasons for practicing basketball, thus succeeding in performing a small hierarchy of the reasons for practicing basketball.

Table 4. Average on reasons for practicing basketball for both teams

Factors	Average	
	ACS U-BT Cluj-Napoca	CS UNIVERSITATEA Cluj-Napoca
Skills / Competition	2.05	3.93
Status Recognition	3.45	3.6
Energy Release	1.28	1.8
Team Atmosphere	2.25	3.2
Affiliation	0.74	1.2
Fitness	1.35	2.6

Conclusions

Following the application of the basketball motivation questionnaire, our study showed that all the results confirm that the hierarchy the reasons for participating in the basketball game show differences between the group of athletes practicing performance sports and involved in a professional league and the group of athletes practicing basketball at the junior level without being included in the professional league.

Thus, as a result of the analysis, we can utter that for those who do not practice basketball at professional level (ACS U-BT), the only significant correlation appears between ego orientation and status recognition. In other words, the motivational factor with the highest weight is the recognition of the status - derived from the extrinsic factor - the ego orientation.

As for basketball players practicing in a league, the hierarchy of reasons for basketball participation is different, with an emphasis on intrinsic motivation - or focus on task in achieving the goal. The most important reasons for this are the desire to improve skills and the need to be in a good physical shape.

On the basis of these results, it is imperative to strengthen the intrinsic motivation among the U-BT Club's athletes. Given the major role of intrinsic motivation, we hereby present some recommendations for coaches to strengthen the intrinsic motivation of basketball players:

- Increasing individual skills;
- Not insisting on performance comparison among athletes;
- Rewarding the effort as well as performance.

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Annexes

The questionnaire on motivation to practice basketball by Gill et al. (1983) (PMQ 30)

There are no correct and wrong answers to this questionnaire, so please respond to each statement and mark the version that applies to you in the answer sheet according to the following options:

3- Not Important At All
2- Of Little Importance
1- Very important

I am physically active because:	Very important	Of Little Importance	Not Important At All
I want to improve my skills	1	2	3
I like hanging out with my friends	1	2	3
I like to win	1	2	3
I want to consume my energy	1	2	3
I like playing basketball	1	2	3
I want to look good	1	2	3
I like excitement	1	2	3
I like teamwork	1	2	3
Parents or close friends want me to play basketball	1	2	3
I want to learn new skills	1	2	3
I like to make new friends	1	2	3
I like to do things I'm not so good at	1	2	3
I want to free myself	1	2	3
I like prizes	1	2	3
I like to do physical exercise	1	2	3
I like to have something to do	1	2	3
I enjoy the action	1	2	3
I like team spirit	1	2	3
I like to get out of the house	1	2	3
I like competition	1	2	3
I like to feel important	1	2	3
I like to be part of a team	1	2	3
I like to do sports at a higher level	1	2	3
I want to be physically fit	1	2	3
I want to be popular	1	2	3
I like challenges	1	2	3
I like the coach	1	2	3
I want to gain status or recognition	1	2	3
I like to have fun	1	2	3
I like to use the equipment or facilities	1	2	3

Age Club you belong to

STUDIA UBB EDUCATIO ARTIS GYMN., LXIV, 2, 2019, pp. 27 - 36
(RECOMMENDED CITATION)
DOI:10.24193/subbeag.64(2).12

PHYSICAL EXERCISE PROGRAM TO REDUCE TRUNK ASYMMETRY IN ADOLESCENCE

BALLA BÉLA JÓZSEF[1], HANȚIU IACOB[1]

ABSTRACT. ***Background*:** Depending on the severity, the nature and the type of the trunk asymmetry, three types of treatment are currently used: (1) conservative treatment with orthopedic brace, (2) physiotherapy and (3) surgical intervention. The efficiency of physical exercises in rehabilitation of spinal deformities is well known. They have been systematically used since the beginning of the 20th century. ***Objectives:*** The main objective of our study was to reduce the trunk asymmetry using an interventional program of physical exercises. ***Study design*:** This study follows a pretest-posttest design with an experimental and a control group. ***Materials and Methods:*** Forty one pupils (27 girls and 14 boys) aged 11.77 (± 0.96) years) were included. The experimental group consisted of 20 pupils and the control of 21 students. Participants were assigned non-randomly to the experiment or control groups. In order to determine the level of physical activity of the subjects, the FELS and PAQ-C questionnaires were applied. Experimental intervention consisted of a physical activity program based on basic gymnastics. Between October 2015 and June 2016 the members of the experimental group participated in our intervention twice a week (50 minutes a session), after their school program, for 8 months. ***Results:*** The mean value of the angle of trunk rotation in the case of experimental group was 6.15º (± 1.56) and 6.52º (± 1.66) in the case of control group. In the final test, it was found that the size of the asymmetry was reduced in both groups. In the case of experimental group the trunk asymmetry value was 4.05º (± 1.66), and in the case of control group 6.00º (± 1.94), meaning a decrease of 2.10º to experimental group and 0.52º to control group. ***Conclusions:*** The main findings are that basic gymnastics exercises can have a beneficial effect on trunk asymmetry, which is the hump will decrease. We recommend the use of these exercises to treat people with moderate or severe trunk asymmetry.

Keywords: *trunk asymmetry, scoliosis, adolescence, physical therapy, exercise.*

REZUMAT. În funcție de gravitatea, natura și tipul asimetriei toracelui, în prezent sunt utilizate trei tipuri de tratament: tratamentul ortopedic prin utilizarea corsetelor corective, tratamentul cinetic și cel chirurgical. Eficiența exercițiilor fizice în reabilitarea deformărilor coloanei vertebrale este bine cunoscută. Acestea au fost folosite sistematic de la începutul secolului al XX-lea. ***Objectives:*** Obiectivul principal al studiului a fost diminuarea asimetriei toracelui folosind un program de

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intervenţie bazate pe exerciţii fizice. ***Study design***: Studiul are un design experimental cu un grup experimental şi unul de control şi cu testare iniţială şi finală. ***Materials and Methods****:* Patruzecişiunu de elevi (27 de fete şi 14 băieţi) cu vârsta de 11.77±(0.96) ani au fost incluşi în studiu. Grupa experimentală a fost alcătuit din 20 de elevi şi cel de control din 21 de elevi. Participanţii au fost repartizaţi în mod nealeatoriu în grupa experimentală sau cea de control. Pentru a determina nivelul activităţii fizice al subiecţilor au fost aplicate chestionarele FELS ŞI PAQ-C. Intervenția experimentală a constat dintr-un program de activitate fizică bazat pe mijloacele gimnasticii de bază. Între octombrie 2015 şi iunie 2016, membrii grupei experimentale au participat la intervenţie de două ori pe săptămână (câte 50 de minute pe fiecare sesiune), după programul şcolar al elevilor, timp de 8 luni. ***Results***: Valoarea mediei unghiul de rotaţie al trunchiul la testarea iniţială la Ge a fost de 6.15º (±1.56) şi de 6.52º (±1.66) în cazul Gc. La finalul intervenției la ambele grupe s-a diminuat mărimea asimetriei, în cazul Ge rezultatul post-testului fiind de 4.05º (±1.66), iar în cazul Gc de 6.00º (±1.94), însemnând o diminuare de 2.10º la Ge şi de 0.52º la cel de control. ***Conclusions***: Constatările principale sunt că exerciţiile fizice din gimnastica de bază pot avea un efect benefic asupra asimetriei toracelui, adică diminuarea acesteia. Recomandăm utilizarea acestor exerciţii în tratarea persoanelor cu asimetria moderată sau severă a toracelui.

Cuvinte cheie: *trunk asymmetry, scoliosis, adolescence, physical therapy.*

Introduction

Trunk asymmetry (TA) as an important indicator of scoliosis recommends the orthopedic assessment of the children if the asymmetry exceeds 7° at the scoliometer. This asymmetry is caused by the existence of a hump in one of the regions of the spine (Grivas et al., 2006). Numerous studies assessed the relationship between the gibbosity and Cobb angle (CA), and found significant correlation between them (Coelho, Bonagamba, & Oliveira, 2013; Griffet, et al., 2000. For example, Lars and Lars (1997) found a moderate strong correlation between the angle of trunk rotation (ATR) and CA in right convex curves p = 0.65 compared to p = 0.57 in left convex curves. Korovessis and Stamatakis (1996) tried to predict a CA from the result of the scoliometer readings, and the authors have constructed two mathematic formulas, which provide accuratelly the scoliotic Cobb angle in young adolescents using only the scoliometer.

The proper use of physical exercises, in addition to decreasing the deviation of the vertebral column (Hawes, 2003; Otman, Kose, & Yakut, 2005), contributes to reducing the risk of progression (Negrini, et al., 2008), develops the aesthetic appearance of the body (Negrini, et al., 2006) and reduces the number of patients requiring orthopedic treatment and surgical treatment (Negrini, Atanasio, et al., 2008).

Cordun (1999) distinguishes the following types of scoliosis: functional scoliosis, scoliotic posture, habitual scoliosis and pathological scoliosis. The pathological scoliosis is a complex deformation of the spine, because the volume of the vertebral body is reduced on the concave side, becomes cuneiform and the presence of the truncal hump is constant. These are irreducible, the flexion of the trunk exacerbates and accentuates the prominence of the existing hump. They comprise two distinct subgroups: (1) structural scoliosis, which etiology is known; (2) structural scoliosis with unknown etiology, also called idiopathic or essential scoliosis. The essential scoliosis represents 85-90% of all scoliosis. According to the same author, these are: infantile scoliosis, juvenile scoliosis and adolescent scoliosis.

Depending on the severity, the nature and the type of TA, three treatments are used: (1) conservative treatment with orthopedic brace, (2) physiotherapy and (3) surgical intervention. The role of physical exercises in rehabilitation of spinal deformities is well known. They are used consistently since the early twentieth century, but the basis has already been made in antiquity (Vasiliadis, Grivas & Kaspiris, 2009). Weiss (2010, p.4) considers that "exercise base therapies, alone or in combination with orthopaedic approaches, are a logical mean to improve and maintain fexibility and function in patients at risk for pain, pulmonary dysfunction, and progression".

The effectiveness of physiotherapy for idiopathic scoliosis is discussed because we do not have enough scientific evidence to confirm this (Mordecai & Dabke, 2012). According to Kotwicki et al (2013, p. 62), "... there is a lack of adequate scientific data confirming the effectiveness of physiotherapy in reducing the risk of progression of scoliosis, on the other, a number of publications indicate the positive influence of exercises on the course of scoliosis".

They are of the opinion that specific physical exercise exercises should be conducted by a trained and certified physiotherapist. These exercises have to be adapted to the individual curvature pattern of the child and treatment phase. The effectiveness of the therapy depends on the child's willingness to cooperate, as well as on the model of the management selected. Also, an objective documentation and verification of the results are necessary.

The American Academy of Orthopedic Surgeons and the American Academy of Pediatrics recommend scoliosis screening (using the Adam's test) for girls aged 11 and 13 for boys once at 13 or 14 years old (Grivas et al., 2007).

Objectives and hypothesis

The primary objective of our study was to reduce the ATR by using basic gymnastic exercises. In the present study, it is assumed that the use of exercises from basic gymnastics in physical education lessens the frequency of TA and decreases the ATR in adolescence with TA.

Materials and methods

Participants

The study included a sample of 41 subjects (27 girls and 14 boys). All participants were students of the Báthory István Theoretical High School in Cluj-Napoca, with an average age of 11.77 (± 0.96) years [min: 10 years and max: 14 years], divided into two groups: Experimental group (Eg) control group (Cg). Eg was formed of 20 subjects (13 girls and 7 boys) with a mean age of 11.71 (± 0.93) years and the Cg of 21 students (14 girls and 7 boys), average age of 11.83 (± 1.01) years.

In order to include a subject in the experiment, the following criteria's were applied:

1. the ATR should exceed ≥5°;
2. the age was between 10 and 15 years;
3. without restrictions to medium-intensity physical activities.

Subjects with TA were previously identified following a school screening program attended by 487 students aged 12.94 (± 1.45) years (Balla & Hanţiu, 2016). Participation in the research was voluntary, it was done with the approval of the county school inspectorate, school leadership and parents.

In the Eg were included 12 pupils (60%) with right thoracic hump and 8 pupils with left thoracic hump (40%), and in the Cg 16 pupils (76%) were with right thoracic hump and 5 pupils with left thoracic hump (24%).

Sampling method

The participants were not randomly assigned to the groups of experiment, because we had a limited number of subjects with an ATR exceeding 5º, and not all of the subjects with the necessary ATR wanted to take part in the experiment. Therefore, in the Eg were included subjects which intended to participate in the intervention (an afterschool program of selected physical exercises), and in the Cg were included those who did not want to take part in the intervention, but both of them had the approval to participate in the experiment.

Methods

Each group was tested at both the beginning and the end of the study. At the beginning, each subject was evaluated (pretest), measured by the ATR, height and body weight At the same time, the subjects completed two questionnaires measuring the level of physical activity: The Physical Activity Questionnaire for Older Children (PAQ-C), which measures physical activty for

the last seven days, and FELS Physical Activity Questionnaire for Children which measures the level of physical activity in children aged 7-19 in the last year before completing the questionnaire These evaluations were repeated after 8 months of the intervention, at the end of the study (post-test).

Statistical analysis

For the analysis of the results, were used the following tests to compare the mean values, depending on the data distribution: independent sample t-Test, dependent sample t-Test, Mann Witney U test for independent samples and Wilcoxon test for pair samples. Gaussian distribution was evaluated using the Shapiro-Wilk test. For the statistical analysis, the 20th version of SPSS was used.

Intervention program

Between October 2015 and June 2016 the members of the experimental group participated at our intervention twice a week (50 minutes a session), after their school program. The exercises included in this program were exclusively from basic gymnastics.

The sessions were divided in four parts. The first one was dedicated to the organization of the subjects and to raise attention. We held a short conversation about their day or past days, and then the themes of the respective session were presented.

The second one was the warming-up phase of the activity. A general warming up and then a special warming up for the trunk (vertebral column) were conducted by the leader of the activity. This part of the session included exercises in walking or in place.

The third one was the most important phase of the session, in which the selected strengthening or stretching exercises were applied. These exercises were executed in place, independently by the established groups. The last one contains a lot of stretching exercises and often entertaining games.

Constitution of the groups by the type of the truncal hump

The TA's were localized during the scoliometer reading. Based on these findings the participants of the experiment were divided in four groups depending on the place of the asymmetry.

1. Right asymmetry on the upper part of the back.
2. Right asymmetry on the lower part of the back.
3. Left asymmetry on the upper part of the back.
4. Left asymmetry on the lower part of the back.

The dosage of the physical effort was stabilized depending on gender, on the level of the motor abilities and on the somatic particularities.

There were also used exercises based on both isometric and isotonic muscle contraction. The majority of the applied exercises was asymmetric (executed just for the left or the right part of the body), but a series of symmetric exercises were also used. Usually, each group had to execute the same exercises, but in different directions and with different amplitudes.

Results

Following the Shapiro-Wilk test, the variables of weight and questionnaire scores (PAQ-C and FELS) were normally distributed, and those of height, BMI and ATR were not normally distributed (see Table 1). Consequently, we will use both non-parametric and parametric significance tests, depending on the type of the tested variable.

Table 1. Mean, standard deviation and Shapiro-Wilk test at initial testing

Variables	Initial values M (±sd)	Shapiro-Wilk df	Shapiro-Wilk Sig.	Result of normality test
Height [cm]	155.6 (±9.30)	41	0.017	NND
Weight [kg]	46.21 (±12.10)	41	0.059	ND
BMI [kg/m^2]	18.91 (±3.78)	41	0.004	NND
ATR [º]	6.34 (±1.60)	41	0.000	NND
Score of PAQ-C	2.84 (±0.65)	41	0.378	ND
Score of FELS	6.37 (± 1.57)	41	0.407	ND

Note: ND – normally distributed; NND – not normally distributed

Table 1 shows the initial mean values of the sample and the result of the normality test.

The FELS questionnaire score at the initial Eg testing was 6.67 (± 1.66), and for Cg of 6.09 (± 1.46), the difference between the mean values being statistically insignificant (t = 1.193, p = 0.240). The difference between group mean values remained insignificant at the end of the experiment *(*t = 1.449, p = 0.155).

Applying the PAQ-C questionnaire was necessary to see whether significant changes occurred or not during the experiment on habits related to students' physical activities. In case of the Eg, the activity score in the pre-test was 2.73 (± 0.66) and in the case of Cg 2.94 (± 0.63), the difference between the two mean values was not significant *(*t = - 1.001, df = 39, p = 0.323). This score of physical activity did not change significantly neither at the end of the

experiment, the values remain similar across the groups: Eg 2.71 (±0.60), and Cg 2.96 (±0.52). The difference between the mean values of the final test was still insignificant *(t* = - 1.400, df = 39, *p* = 0.169). For the testing of intragroup changes, the dependent sample *t* test was used, but neither of the two groups confirmed significant changes in the mean values, the results of the statistical analysis being: *t* = 0.689, *p* = 0.499 for Eg and *t* = - 0.544, *p* = 0.593 for Cg.

The mean value of the ATR in the case of Eg was 6.15º (± 1.56) and 6.52º (± 1.66) in the case of Cg, there was no statistically significant difference between the mean group values *(U* = 177.5, N = 41, *p* = .380). In the final test, it was found that the size of the asymmetry was reduced in both groups. In the case of Eg the TA value was 4.05º (± 1.66), and in the case of Cg 6.00º (± 1.94), meaning a decrease of 2.10º to Eg and 0.52º to Cg. The difference between the mean values of ATR at the end of the experiment (2.10 - 0.52 = 1.58) became statistically significant *(U* = 92.5, *p* = .002), the effect size was estimated by Cohen coefficient (d = 0.95). Table 2 presents the results of the comparative analysis using the *t* test for independent samples and the Mann-Whitney test.

Table 2. Comparative analysis of the results of the measurements at the beginning and end of the experiment for the experimental and control group

Variables	Pre-test			Post-test		
	Eg (N=20) M (±sd)	Cg (N= 21) M (±sd)	Independent sample t-test or Mann-Whitney U test	Eg (N=20) M (±sd)	Cg (N= 21) M (±sd)	Independent sample t-test or Mann-Whitney U test
Height [cm]	155.8 (±10.5)	155.4 (±8.1)	$U = 196, p = .715$	162.3 (±9.5)	161.5 (±7.5)	$U = 208.5, p = .969$
Weight [kg]	45.5 (±13.0)	46.9 (±11.4)	$t = -.366, df = 39, p = .716$	50.8 (±13.7)	52.2 (±12.3)	$t = -.365, df = 39, p = .717$
BMI [kg/m²]	18.4 (±3.8)	19.2 (±3.7)	$U = 168.0, p = .273$	19.0 (±3.9)	19.8 (±3.6)	$U = 179, p = .419$
PAQ-C	2.73 (±0.66)	2.94 (±0.63)	$t = -1.001, df = 39, p = .323$	2.71 (±0.60)	2.96 (±0.52)	$t = -1.400, df = 39, p = .169$
FELS	6.67 (±1.66)	6.09 (±1.46)	$t = 1.193, df = 39, p = .240$	6.84 (±1.69)	6.10 (±1.57)	$t = 1.449, df = 39, p = .155$
ATR [º]	6.15 (±1.56)	6.52 (±1.66)	$U = 177.5, p = .380$	4.05 (±1.66)	6.00 (±1.94)	$U = 92.5, p = .002$

The Wilcoxon signed rank test was used to analyze whether there was any significant difference between the results of the initial measurements and the final results in the subjects who participated at the therapeutic program (Eg). In the post-test, the mean values of TA were found to be significantly lower (*Z* = - 3.710, *p* = 0.000). In case of Cg the difference remained insignificant (*Z* = - 1.555, *p* = 0.120. Table 3 presents the results of the comparative analysis after the *t* test for the dependent samples and the Wilcoxon test.

In September 2016, the groups were retested by scoliometric measurement to assess the consistency of the effects caused by the intervention program. The mean value of TA at Cg at the end of the experiment was 6.0°, and at 4.05 ° in Eg. Over the next four months, minor changes occurred in the mean values of TA in both groups. The value of TA fell to 5.76° in Cg, and to 3.95° in Eg. The statistical analysis shows that no significant changes occurred in the mean values of TA, nor for Cg *(t* = 1.156, df = 20, *p* = 0.261), or Eg *(t* = 0.623, df = 19, *p* = 0.541).

Table 3. Comparative analysis of the results of the measurements at the beginning and end of the experiment for the experimental and control group

Variables	Experimental group			Control group		
	Pre-test	Post-test	Paired sample t-test or Wilcoxon Signed-Rank Test	Pre-test	Post-test	Paired sample t-test or Wilcoxon Signed-Rank Test
Height [cm]	155.8 (±10.	162.3 (±9.5)	*Z = - 3.926, p = .000*	155.4 (±8.1)	161.5 (±7.5)	*Z = - 3.941, p = .000*
Weight [kg]	45.5 (±13.0	50.8 (±13.7)	*t = -8.431, df = 19, p = .000*	46.9 (±11.4)	52.2 (±12.3)	*t = -9.649, df = 20, p = .000*
BMI [kg/m	18.4 (±3.8)	19.0 (±3.9)	*Z = - 2.782, p = .005*	19.2 (±3.7)	19.8 (±3.6)	*Z = - 2.798, p = .005*
PAQ-C	2.73 (±0.66	2.71 (±0.60)	*t = -.689, df = 19, p = .499*	2.94 (±0.63)	2.96 (±0.52)	*t = -.544, df = 20, p = .593*
FELS	6.67 (±1.66	6.84 (±1.69)	*t = -2.353, df = 19, p = .030*	6.09 (±1.46)	6.10 (±1.57)	*t = -.172, df = 20, p = .865*
ATR [º]	6.15 (±1.56	4.05 (±1.66)	*Z* = - 3.710, p = .000	6.52 (±1.66)	6.00 (±1.94)	*Z* = - 1.555, p = .120

Discussion

After analyzing the results of the subjects, it was found that the value of the initial mean ATR at the Eg decreased from 6.15º (± 1.56) to 4.05º (± 1.66) at the end of the experiment, this being an improvement of 2.10º. Also, the ATR was diminished at the CG by 0.52º. This phenomenon of spontaneous improvement has been reported by numerous studies (Brooks, Azen, Gerberg, Brooks, & Chan, 1975; Pin, et al., 1985).

Modi et al (2010) followed-up the progression of scoliosis curves in 169 children (mean age was 9.2 years) during one year. According to this study, the amount of the curve decreased at 32.5% in case of the examined subjects, remained unchanged at 41.4% and progressed at 26%. We have mentioned that the effectiveness of physical therapy in treating severe spine deficiencies is the most controversial of all treatment modalities. However, our study demonstrated that by applying basic gymnastics exercises, the ATR decreased by 2.10º while subjects in the control group had a decrease of only 0.52º.

Negrini et al (2006) conducted a prospective study on 110 patients diagnosed with adolescent idiopathic scoliosis. The initial value of ATR was 14.4° (±6.0), but after they went through a special exercise program (Scientific Exercises Approach to Scoliosis), the ATR was reduced with 2º .

It is important to emphasize that the physical exercises we used from basic gymnastics were carefully selected. They were mostly executed asymmetrically, and most of them were trunk exercises. Although, we did not manage to individualize all the exercises, the subjects were grouped according to the type of the TA, each group received specific indications regarding the direction, amplitude and dosage of the exercises.

The applied questionnaires have shown that the level of physical activity has not changed compared to the pre-experimental period. Consequently, we can conclude that the decrease in ATR was generated by physical activities within the intervention program.

Conclusions

As a result of this study, it has been found that the application of exercises from basic gymnastics, especially exercises with portable objects, free exercises, gymnastics bench and on stall bar, can have beneficial effect on TA, ie the result will be the decrease of the thoracic hump.

We recommend the use of these exercises in the treatment of people with moderate or severe TA, if the general principles of treatment are respected (symmetrical tightening of the muscles on the convex part of spine and lengthening the muscles on the concave side).

We also recommend the performing of a screening by the school doctor or the physical educators at the beginning of each school year for all pupils in case of girls at the age of 10-13 and in case of boys at 11-13 years, as well as the use of corrective gymnastics exercises by the teachers in the physical education lessons. This is possible in the third part of the lesson (the selective influence of the locomotor apparatus) or by the differential treatment of the pupils in the physical education lesson.

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STUDIA UBB EDUCATIO ARTIS GYMN., LXIV, 2, 2019, pp. 37 - 46
(RECOMMENDED CITATION)
DOI:10.24193/subbeag.64(2).13

THE EFFECT OF PHYSICAL ACTIVITY PROGRAMS IN FITNESS HALLS ON BODY WEIGHT

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ABSTRACT. ***Introduction.*** Recent epidemiological studies have highlighted increased obesity rates all over the world, of sometimes epidemic proportions. The World Health Organization recommends individuals to constantly practicing physical activities, since many specialists have noted the obvious contribution of physical activity to human health management, well-being and labour productivity. ***Objectives***. The main objective of this study was to analyse the effect of different types of aerobic physical activity practiced in fitness rooms on weight loss. ***Methods***. This research included 88 female practitioners in two fitness halls in the city of Oradea and the length of the study was eight months. Depending on the type of physical activity practiced, five groups were formed. Participation in the study was on a voluntary basis. Somatic measurements were carried out at the beginning and the end of the physical activity intervention program. The data thus collected were statistically analysed with SPSS, version 20.0. ***Results*****.** This study has shown the contribution of physical activities to body weight management, with an average body weight loss of 4.31 kg (ranging from 2.88 kg to 5.62 kg), a body fat decrease by 6.24%, of the body adiposity index by 2.17% and the hip circumference by 4.69 cm. ***Conclusions*****.** Regular participation in physical activity programs can contribute to loss of weight and body fat, while the type of physical activity plays a determining role.

Key words: *recreational physical activity, aerobic, body composition, body adiposity index*, *obesity risk, body mass index.*

REZUMAT. ***Efectul programelor de activitate fizică din săli de fitness asupra greutății corporale. Introducere.*** Studii epidemiologice recente semnalează creşterea prevalenţei obezităţii în lume ajungându-se uneori la proporţii epidemice. Organizația Mondială a Sănătății recomandă practicarea constantă a activităților fizice, mulţi specialişti au remarcat că este evidentă contribuţia acestora în managementul sănătății, asupra stării de bine şi productivităţii muncii. ***Obiective.*** Obiectivul principal al acestui studiu a fost analiza efectului diferitelor tipuri de activitate fizică aerobă practicate în săli fitness asupra scăderii greutății corporale. ***Metode*****.** La acest studiu au participat 88 de persoane de gen feminin, practicante

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de exerciţii fizice în două săli de fitness din oraşul Oradea timp de 8 luni. În funcţie de tipul de activitate fizică practicată au fost formate 5 grupe. Participarea la studiu a fost voluntară. Au fost efectuate măsurători somatice la începutul şi finalul programului de intervenţie. Datele au fost analizate statistic cu programul SPSS, varianta 20.0. ***Rezultate***. Studiul prezent a demonstrat contribuția activităților fizice în managementul greutății, cu efect de reducere a masei corporale în medie cu 4,31 kg (de la 2,88 kg până la 5,62 kg), scăderea procentului de țesut adipos cu 6,24%, a indicelui de adipozitate cu 2,17% și a circumferinței șoldului cu 4,69 cm. ***Concluzii.*** Participarea cu regularitate la programe de activitate fizică poate să contribuie la pierderea de greutate şi de ţesut adipos, tipul de activitate fizică practicată având rol determinant.

Cuvinte cheie: *activităţi fizice recreative, aerobic, compoziţie corporală, indice de adipozitate, risc de obezitate, indice de masă corporală.*

Introduction

Several epidemiological studies indicate an increase in the prevalence of obesity worldwide taking on epidemic proportions (WHO, 2000). It is well-known that excessive adiposity is strongly associated with cardiovascular disease risk factors such as hypertension, diabetes and dyslipidaemia (Cornier, Despres, Davis, Grossniklaus, Klein, Lamarche et al., 2011). Low, Chin, Deurenberg-Yap (2009) claim that "Obesity increases the risk of chronic diseases such as diabetes mellitus, cardiovascular disease, stroke and some forms of cancer. It is a serious public health problem that increases in low-income or middle-income countries."

Aerobic training is of interest to the female population, with more and more people choosing fitness rooms and aerobics as physical activities during their spare time. The *American College of Sports Medicine* recommends constantly practicing physical activities as their contribution to health management, well-being and labour productivity is obvious" (Pate, Pratt, Blair, Haskell, Macera, Bouchard, King, 1995).

According to the scientific research, practicing physical exercise can reduce the risk of diseases such as osteoporosis (Welten, Kemper, & Post, 1994), cardiovascular diseases (Berlin & Colditz, 1990), type II diabetes (Macdonald, Philip, Harrison, And Watt, 2006; Spelsberg, 1994), colon cancer (Slattery, Potter, Caan et al., 1997), and obesity (Cortright, Sandhoff, Basilo et al., 2006). If practiced on a regular basis, physical exercise has been shown to be effective in managing stress and improving the treatment of depression (Simonsick, 1991), as well as improving body image (Suris & Parera, 2005; Williams & Cash, 2001).

This study aimed at studying the effects of physical activity programs performed in fitness rooms on body weight, body fat percentage and body mass

index (BMI) of female subjects. The study also aimed to analyse the effectiveness of the different types of physical activity programs practiced by the subjects included in the study.

The objectives of our study were to find out whether following the participation in various aerobic gymnastics programs for eight months, effects were noticed on:

- body mass;
- body fat percentage;
- body adiposity index;
- body mass index;

In this study, we started from the assumption that regular exercise of physical activity can cause weight loss and such a decrease depends on the type of physical activity performed.

Material and methods

In this study, 88 female subjects were divided into five groups, depending on the type of physical activity they participated in, as follows: Group 1 - circuit (n = 13); Group 2 - softball (n = 17); Group 3 – Fit ball (n = 20); Group 4 - toning body (n = 20); Group 5 - Tae-Bo (n = 18). The breakdown by groups was made according to the subject's choice for a certain type of physical activity. The research has been conducted for eight months, i.e. from 20.01.2015 to 20.09.2015, in two fitness halls in Oradea.

We carried out measurements of body mass (weight), height, hip circumference, and skinfolds (five skinfolds: triceps, subscapular, suprailiac, abdominal, biceps) before and after the physical activity intervention programs. Weight and height of subjects were used for BMI calculation, and hip circumference and height for calculating the body adiposity index.

The body adiposity index (BAI) was calculated by the formula below:

$$\text{Body Adiposity Index} = (\text{Hip Circumference cm} / \text{Height in m}^{1.5}) - 18$$

and the body fat percentage (BFP) by the formula below:

$$\text{BFP (\%)} = \Sigma \text{ 5 skinfolds (in mm)} \times 0.15 + 5.8 + \text{body area in m}^2$$

The data collected were statistically processed using the SPSS software, version 20.0. Central tendency parameters were calculated, and averages recorded in experimental groups were compared using parametric or nonparametric tests, depending on the data distribution. For the comparison of the differences among group means, we used the analysis of variance – ANOVA - for normal distribution data or the Kruskal-Wallis nonparametric test for non-uniform values or ranks. Distribution testing was done using the Shapiro-Wilk test.

The aerobics training took place twice a week, with a total training period of 60 minutes. A registration form was used to collect the data, and in order to have subjects' acceptance to participate in the study, a data processing sheet and a participation agreement were signed by both parties before starting the activity.

Initial testing (T1) took place in January 2015, and final testing (T2) in September 2015.

Results

The subjects included in the study were women with an average age of 33.01 (± 8.45), the youngest subject being of 22 years old, and the oldest subject of 56 years old. Measurements were made at the beginning of the study (T1) for body mass, height, skinfolds, Body Mass Index (BMI), Body Adiposity Index (BAI) and the Body Fat Percentage (BFP) were calculated too (Table no. 1).

Table 1. Descriptive statistics of subjects participating in the study (N = 88)

	N	Minimum	Maximum	Mean	Std. Deviation
Age (years)	88	22	56	33.01	8.45
Body mass (kg)	88	47	89	63.36	9.29
Height (cm)	88	158	176	167.61	4.11
Hip circumference (cm)	88	87.00	120.00	101.56	7.90
BFP (%)	88	15	44	28.32	6.73
BMI (kg/m^2)	88	17.11	29.41	22.56	3.14
BAI (%)	88	21.21	37.71	28.84	4.05
Valid N (list wise)	88				

The means and the standard deviations of the variables, according to the groups in which the subjects were distributed, are presented in Table no. 2.

Table 2. Mean and standard deviation of variables in initial testing by group

Group	Body mass (kg)	Height (m)	Body surface (m^2)	Body Fat (%)	BMI (kg/m^2)	BAI (%)
1 (N=13)	66.77(10.91)	166.85 (4.49)	2.00 (.00)	29.85 (6.31)	23.97 (3.27)	29.95 (3.53)
2 (N=17)	61.4711.25)	168.53 (4.43)	1.94 (.24)	31.18 (6.27)	21.66 (3.72)	27.94 (4.05)
3 (N=20)	64.40 (8.50)	168.00 (4.13)	2.00 (.00)	24.00 (5.09)	22.92 (3.31)	30.18 (4.24)
4 (N=20)	61.05 (6.61)	166.95 (3.47)	2.00 (.00)	33.30 (5.61)	21.79 (2.38)	27.38 (4.26)
5 (N=18)	64.11 (9.37)	167.61 (4.39)	1.97 (.10)	23.78 (4.13)	22.84 (2.81)	29.03 (3.59)

In view of comparing the means of the subjects included in the five groups, the testing the normal distribution was performed using the Shapiro-Wilk test. According to Table no. 3, the data are normally distributed for following variables: body mass, body fat percentage (except for subjects in Group 5), BMI and body adiposity index (BAI), and as far as the age variable is concerned, data are

not normally distributed (except for subjects in Group 1). Consequently, in order to run the test of significance of differences in the case variables non-normally distributed variables, we use nonparametric tests.

The running of Kruskal-Wallis nonparametric test, by which we compared the mean age of the subjects distributed in the five groups, indicates that the means are different from the point of view statistical data (p = 001). In the case of variables body mass, height and BMI, the ANOVA test shows that differences in group means are not significant: body mass (F = 1.045, df = 4, p =.389); height (F = 1.478, df = 4, p = 0.216), BMI (F = 1.478, df = 4, p = .216). In contrast, the difference between group means in terms of body fat variable is significant (F = 4.383, df = 4, p =.003).

Table 3. Testing the normality of the distribution of variables according to the type of physical activity performed

Variable	Subgroup	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistical	df	Sig.	Statistical	df	Sig.
Age (years)	1	0.137	13	0.200*	0.976	13	0.957
	2	0.227	17	0.020	0.847	17	0.010
	3	0.264	20	0.001	0.673	20	0.000
	4	0.208	20	0.024	0.867	20	0.010
	5	0.155	18	0.200*	0.886	18	0.034
Body mass (kg)	1	0.184	13	0.200*	0.933	13	0.369
	2	0.187	17	0.116	0.923	17	0.168
	3	0.139	20	0.200*	0.940	20	0.240
	4	0.136	20	0.200*	0.950	20	0.361
	5	0.129	18	0.200*	0.926	18	0.165
Body Fat (%)	1	0.196	13	0.183	0.878	13	0.068
	2	0.197	17	0.078	0.942	17	0.345
	3	0.122	20	0.200*	0.940	20	0.236
	4	0.122	20	0.200*	0.970	20	0.755
	5	0.219	18	0.022	0.842	18	0.006
BMI (kg/m^2)	1	0.143	13	0.200*	0.937	13	0.415
	2	0.156	17	0.200*	0.922	17	0.157
	3	0.099	20	0.200*	0.951	20	0.375
	4	0.107	20	0.200*	0.963	20	0.610
	5	0.141	18	0.200*	0.967	18	0.732
BAI (%)	1	0.113	12	0.200*	0.970	12	0.911
	2	0.117	17	0.200*	0.936	17	0.273
	3	0.072	20	0.200*	0.977	20	0.885
	4	0.161	20	0.184	0.939	20	0.233
	5	0.096	19	0.200*	0.978	19	0.918

*. This is a lower bound of the true significance. a. Lilliefors Significance Correction

After the physical activity intervention program was performed for eight months, the subjects were tested again (T2), the statistical processing of the data revealing the effects of this intervention program. Body mass and skinfolds were measured, then the percentage of body fat and body mass index were calculated.

Because data was normally distributed, except for the body fat percentage in Group 3, the paired sample t-test, was used to compare the means. Analysing the results of this test in all subjects included in the research we find that the differences are significant for the variables body mass, body fat, BMI, hip circumference and body adiposity index (Table no.4).

Table 4. The paired sample t-test (N = 88)

Pair sample variables	t	df	Sig. (2-tailed)
Body mass (kg) T1 – Body mass (kg) T2	15.408	87	0.000
Body Fat (%) T1 – Body Fat (%) T2	21.759	87	0.000
BMI (kg/m²) T1 – BMI (kg/m²) T2	15.409	87	0.000
Hip circumference (cm) T1 – Hip circumference (cm) T2	13.548	87	0.000
BAI T1 (%) – BAI T2 (%)	13.472	87	0.000

The same can be mentioned if we compare the means of these variables depending on the type of physical activity performed by the subjects (Table no. 5). Consequently, the results show that physical exercise programs in fitness rooms caused significant changes in body mass, body fat, body mass index and body adiposity index.

Table 5. The paired sample t-test by type of physical activity

Group	Paired sample variable	t	df	Sig. (2-tailed)
1 (N=13)	Body mass (kg) 1 – Body mass (kg) 2	5.744	12	0.000
	Body Fat (%) 1 – Body Fat (%) 2	9.679	12	0.000
	BMI 1 – BMI 2	6.453	12	0.000
	Body Adiposity Index 1 – Body Adiposity Index 2	4.727	12	0.001
2 (N=17)	Body mass (kg) 1 – Body mass (kg) 2	4.962	16	0.000
	Body Fat (%) 1 – Body Fat (%) 2	7.778	16	0.000
	BMI 1 – BMI 2	4.961	16	0.000
	Body Adiposity Index 1 – Body Adiposity Index 2	4.116	16	0.001
3 (N=20)	Body mass (kg) 1 – Body mass (kg) 2	9.489	19	0.000
	Body Fat (%) 1 – Body Fat (%) 2	12.943	19	0.000
	BMI 1 – BMI 2	9.372	19	0.000
	Body Adiposity Index 1 – Body Adiposity Index 2	8.576	19	0.000
4 (N=20)	Body mass (kg) 1 – Body mass (kg) 2	8.853	19	0.000
	Body Fat (%) 1 – Body Fat (%) 2	19.222	19	0.000
	BMI 1 – BMI 2	7.393	19	0.000
	Body Adiposity Index 1 – Body Adiposity Index 2	7.688	19	0.000
5 (N=18)	Body mass (kg) 1 – Body mass (kg) 2	8.363	17	0.000
	Body Fat (%) 1 – Body Fat (%) 2	23.805	17	0.000
	BMI 1 – BMI 2	8.907	17	0.000
	Body Adiposity Index 1 – Body Adiposity Index 2	11.142	17	0.000

Observing the data in Table no. 6, we find that there is a positive relation and statistically significant correlation between the variables body mass, BMI and body fat percentage (BFP) in subjects in all groups.

Table 6. Correlations between age, body mass, Body Fatand BMI of subjects (N = 88)

Group	Variable	Body Fat(%)	BMI (kg/m^2)	Body mass (kg)	Age (years)
1 (N=13)	Body Fat (%)	1	0.722**	0.724**	0.410
	BMI (kg/m^2)	0.722**	1	0.936**	0.062
	Body mass (kg)	0.724**	0.936**	1	-0.025
	Age (years)	0.410	0.062	-0.025	1
2 (N=17)	Body Fat (%)	1	0.932**	0.929**	0.428
	BMI (kg/m^2)	0.932**	1	0.949**	0.425
	Body mass (kg)	0.929**	0.949**	1	0.347
	Age (years)	0.428	0.425	0.347	1
3 (N=20)	Body Fat (%)	1	0.715**	0.756**	-0.150
	BMI (kg/m^2)	0.715**	1	0.940**	-0.019
	Body mass (kg)	0.756**	0.940**	1	-0.100
	Age (years)	-0.150	-0.019	-0.100	1
4 (N=20)	Body Fat (%)	1	0.750**	0.889**	0.258
	BMI (kg/m^2)	0.750**	1	0.912**	0.193
	Body mass (kg)	0.889**	0.912**	1	0.133
	Age (years)	0.258	0.193	0.133	1
5 (N=18)	Body Fat (%)	1	0.788**	0.803**	-0.176
	BMI (kg/m^2)	0.788**	1	0.912**	-0.194
	Body mass (kg)	0.803**	0.912**	1	-0.225
	Age (years)	-0.176	-0.194	-0.225	1

**. Correlation is significant at the 0.01 level (2-tailed).

At the same time, the relationship is poor between the same variables aforementioned and the age variable that is we can not say that subjects of a certain age have lost more weight or have a lower body fat percentage.

Discussions

According to the comparative analysis of the data recorded in the initial and final tests, significant differences were found in all groups, but the influence of the types of physical activity differs from one variable to another (Table no. 7). Thus, the biggest effect on body mass was the circuit program (with a loss of 5.62 kg.), and the toning body program (with a loss of 5.40 kg.), while the lowest average weight loss was recorded in the group practicing the softball program (2.88 kg.). Since the highest weight loss was recorded in the group practicing the circuit program, it is natural that the highest difference in terms of body mass index (2.05 kg/m^2) be also recorded in this group.

Table 7. The effect of type of physical activity on body mass, BFP, BAI, hip circumference and BMI

Variable	Sample	Group				
	N (=88)	1 (N=13)	2 (N=17)	3 (N=20)	4 (N=20)	5 (N=18)
Body mass (kg)	4.31	5.62	2.88	3.85	5.40	4.00
BFP (%)	6.24	2.32	4.40	4.44	13.40	4.86
BAI (%)	2.17	1.82	1.32	1.89	3.52	2.05
Hip circumference (cm)	4.69	3.92	2.88	4.10	7.55	4.44
BMI (kg/m^2)	1.52	2.05	1.06	1.38	1.75	1.45

From the point of view of the effect of the type of physical activity on decreasing the percentage of Body Fat and the hip circumference, the highest scores were recorded in Group 4 (13.40% and 7.55 respectively). The lowest loss of Body Fatwas recorded in Group 1 (2.32%), and in Group 2 the hip circumference was 2.88 cm lower at the end of the physical activity intervention program.

The effect of aerobic exercise on female subjects was also studied by Siqiang Duo (2018). He analysed the influence of aerobic activities on obese female students and concluded that practicing aerobic exercises had a positive effect on the weight loss of students and their physical and mental health. Clark (2015) argues that exercise efficacy is directly proportional to their intensity, regardless of the methodology used in the intervention protocol (whether a food plan is included or not). Moreover, he argues that there is a clear delimitation between the types of exercises used and the efficacy of responses induction.

Other studies demonstrated that physical exercise is effective in loosing body weight. Ward and Bar-Or (1993) reviewed 13 studies based on aerobic exercise for a period of 9 to 18 months. The percentage of body fat has decreased from 10% to 5% in all 13 reviewed studies. According to Grilo (1994), people who exercise constantly achieve better results in decreasing their body weight than those who are exercising less.

Ross, Janssen, Dawson et al. (2004) recorded similar results in a study encompassing a sample of 17 post-menopausal obese women (aged ~ 43) who burned 500 calories a day (a maximum rate of 80%) for 14 weeks in an aerobic exercise program and had a weight loss of 6.8%.

Results similar to those we recorded were reported in a study by King, Hopkins, Caudwell, Stubbs, and Blundell (2008), which showed a weight loss of 4.1% in a sample of overweight and obese women who participated in a 12 weeks training program, five sessions a week, recording a 500 kcal burning each session.

Specific literature has certain limitations when it comes to the link between weight loss and the difficulty of exercises, and the results are mixed. For example, Jakicic, Otto, Lang, et al (2011) demonstrated in a predominantly female random sample (~ 90%) who practiced physical exercise for 18 months,

an insignificant weight loss. Church, Blair, Cocreham, Johannsen, Johnson, Kramer, and Earnest. (2010) showed similar results in their study, which lasted for 6 months with subjects practicing supervised exercises, 3-4 times a week, with a 50% consumption of the maximum oxygen volume, their sample being divided into three groups, and the weight loss recorded was minimal and did not increase significantly with the increased difficulty of exercise.

Conclusions

This study found that practicing of regular physical recreational exercise by adult women for eight months causes loss of body weight and decrease of hip circumference, reduces the body fat percentage, decreases the body adiposity index and body mass index. Significant differences were found between the different types of physical activity practiced by the subjects involved in the study. We also found that between body mass, the body fat percentage and BMI there is a positive relation and statistically significant relationship, but that this relationship is not significant depending on the age of the participants in the study. Thus, the research assumption was verified and confirmed.

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STUDIA UBB EDUCATIO ARTIS GYMN., LXIV, 2, 2019, pp. 47 - 56
(RECOMMENDED CITATION)
DOI:10.24193/subbeag.64(2).14

TENNIS AS A RECREATIONAL PHYSICAL ACTIVITY FOR ADULTS: THE EFFECT ON PHYSICAL FITNESS

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ABSTRACT. ***Introduction.*** The benefits of leisure-time physical activity on health are known and proven in the specialized literature. Among these we can mention the reduction of mortality, cardiovascular disease and various types of cancer, low back pain or depressive symptoms; therefore, it can be asserted that practicing physical leisure time activities is one of the key elements of active and healthy aging. ***Objective.*** The purpose of the research is to analyze the effect of a physical leisure time program, based on the organized practice of tennis, on the physical fitness of subjects which work in a sedentary environment. ***Methods.*** The research was carried out on a sample of 43 subjects working in the IT domain in Cluj-Napoca. During the study, which lasted 4.5 months, the subjects in the experiment group (n = 27) participated in a recreational tennis practice program. During this time, the subjects in the control group (n = 16) continued their daily activities without participating in new activities involving physical exercise. The physical fitness of the subjects was evaluated using the Eurofit Test Battery for Adults at the beginning and at the end of the intervention program. The data was statistically processed using SPSS, version 20. ***Results.*** In the case of the experimental group, significant differences were recorded between the two measurements of balance, plate-tapping test, vertical jump, hand grip, bent-arm-hang test, shuttle run and VO_2max, whereas for the control group there were no significant differences in the plate-tapping test. After the intervention, there were statistically significant differences between the two groups as regards the hand grip strength, the bent-arm-hang test, the shuttle run and the VO_2max. ***Conclusions.*** The changes of the indices at the end of the intervention support the hypothesis that a tennis training program can improve the physical fitness of the participants.

Keywords: *fitness, sedentariness, leisure time, tennis, physical activities for adults*

REZUMAT. ***Tenisul de câmp ca activitate fizică recreativă la adulți: efectul asupra fitnesului fizic. Introducere.*** Beneficiile activității fizice de loisir asupra sănătății sunt cunoscute și dovedite în literatura de specialitate. Dintre acestea putem aminti reducerea mortalității, a maladiilor cardiovasculare, a diferitelor tipuri de cancer, a durerilor lombare sau a simtomelor depresive, astfel că

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putem afirma că practicarea activităţilor fizice de timp liber este unul din elementele cheie ale îmbătrânirii active şi sănătoase. ***Obiectiv.*** Scopul cercetării a fost analiza efectului unui program de activitate fizică de timp liber bazat pe practicarea organizată a tenisului de câmp asupra fitnessului fizic la subiecţi care desfăşoară actvitate de muncă de tip sedentar. ***Metode.*** Cercetarea a fost efectuată pe un eşantion de 43 de subiecţi care lucrau în Cluj-Napoca în domeniul IT-ului. Pe parcursul studiului, care a durat 4.5 luni, subiecţii din grupa de experiment (n=27) au participat la un program de practicare a tenisului recreaţional. În tot acest timp, subiecţii din grupa de control (n=16) şi-au continuat activităţile zilnice fără a participa în mod organizat la noi activităţi care implică exerciţiile fizice. Fitnessul fizic al subiecţilor a fost evaluat cu ajutorul bateriei de teste Eurofit pentru Adulţi la începutul şi finalul programului de intervenţie. Datele au fost prelucrate statistic cu ajutorul SPSS, versiunea 20. ***Rezultate.*** În cazul grupului experimental au fost înregistrate diferenţe semnificative între cele două măsurători în privinţa echilibrului, tesului atinge-plăcile, detentei, forţa flexorilor palmari, testului bent-arm-hang, alergării de navetă şi a VO_2max, în timp ce în cazul grupului de control nu există diferenţe semnificative decât în cazul testului atinge-plăcile. După intervenţie s-au înregistrat diferenţe semnificative statistic între mediile celor două grupuri în cazul forţei flexorilor palmari, testului bent-arm-hang, alergării de navetă şi VO_2max. ***Concluzii.*** Modificările indicilor la finalul intervenţiei susţin ipoteza că un program de antrenament în tenisul de câmp poate ameliora fitness-ul fizic al participanţilor.

Cuvinte cheie: *fitness, sedentarism, loisir, tenis de câmp, activităţi fizice pentru adulţi*

Introduction

Sedentary workplaces are considered to be a possible health risk factor. According to Wen & Wu (2012), out of the 36 million worldwide deaths related to non-communicable diseases, 5.3 million deaths are related to physical inactivity. As stated by Ng & Popkin (2012), the number of sedentary work and leisure activities has increased a lot lately, from 26 to 38 hours per week between 1965 and 2009 in the United States and from 30 to 42 hours between 1960 and 2005 in the United Kingdom, with alarming prospects for 2030.

According to the French statistics published by La Direction de l' Animation de la recherche, des Études et des Statistiques (DARES) and based on the Sumer survey, the percentage of employees who work more than 20 hours per week in front of a screen increased within the same period of time from 11.9% in 1994 to 22.6% in 2010, with a sharp increase in the case of those who hold positions such as manager, from 18.3% to 46.1% (Arnaudo, et

al., 2012). Due to these reasons, employers are recommended to implement physical activity programs for employees.

On the opposite side, there are the positive effects of regular exercise and physical activity. Among the benefits of leisure-time physical activities on health we can mention the reduction of: mortality in general (Kelly, Kahlmeier, & Gotschi, 2014), mortality and cardiovascular diseases (Wilmot, Edwardson, & Achana, 2012), mortality due to colon cancer (Je, Steffens, Maher, & S, 2016) and breast cancer (Fong, Ho, & P, Conesa, Stubbs, & Vancampfort, 2016), low back pain (Steffens, Maher, & S, 2016) or depressive symptoms (Catalan-Matamoros, Gomez-Conesa, Stubbs, & Vancampfort, 2016). Also, practicing physical activity in leisure time is one of the key elements of active and healthy aging (Hupin, Roche, & Gremeaux, 2015).

Epidemiological studies carried out by Pronk, Lowry, Kottke, Austin, Gallagher, & Katz (2010) highlighted the importance of physical activity in disease prevention, health care, functional status and even in productivity.

Pate & Buchner (2014) present some case studies that provide important insights on efforts to successfully implement health improvement strategies at workplaces. The programs presented were applied to people from a wide variety of companies and organizations: truck drivers, school systems, companies from the energetic industry and healthcare organizations. The common elements of these interventions include the importance of organizational culture, the employee support provided by the company's management, the comprehensive program-related options, the multi-layered interventions (from the behavioral change of the individual to the environmental and resolution solutions), the communication within the program and the assessment which allows the monitoring of the program's impact and continuous improvement.

Studies in the United States consider physical activity and fitness as key components of employee welfare strategies (Pronk, Benedict, Young, & Sill, 2014). As evidence, companies like IBM view the concept of wellness or well-being as something more than just the focus on the reduction of health risks and they are also oriented towards the individual's ability to thrive, to "flourish". Herman, Musich, Lu, Sill, Young, & Edington (2006) determined that, on average, health risks related to reduced physical activity were limited by 8.2% among participants in the program. In addition, participants have experienced significant improvements in their life satisfaction, perception of their own health, risk status, smoking and body weight.

The scientific literature on self-monitoring techniques, change stages, social support, stimulants and exercise played an important role in the design approach of the IBM program (Helsel, Jakicic, &Otto, 2007, Herman, Musich, Lu, Edington, 2006).

Practicing physical exercise regularly results in lowering health care spending. The analyzes conducted by Keyes & Grzywacz (2005) and Lu, Schultz,

Sill, Petersen, Young, & Edington (2008) indicated an increase of 291 USD of the average health care expense for the participants of a workplace in a physical activity program, compared with an increase of 360 USD per year for non-participants. The authors concluded that programs focused on the improvement of physical and mental health and on the employees' vitality contributed to health spending reduction, productivity gains and improvement of life quality indices.

Objectives

The purpose of the research was to analyze the effect which a leisure-time physical activity program, based on the organized practice of tennis, had on physical fitness of subjects which worked in a sedentary environment.

The objectives of this research were the elaboration of an intervention program, an assessment of motor abilities of the selected subjects, before and after the intervention, as well as a comparison of the means of the results of the initial and final measurements.

The present research is based on the assumption that physical fitness indices of a group of subjects which worked in a sedentary environment improved as a consequence of their participation at a tennis practice program.

Materials and methods

The research was conducted on a sample of 43 subjects whose workplace implied a sedentary activity (they worked in Cluj-Napoca in the IT field). Participants were divided into two groups - 27 subjects (12 women and 15 men) in the experiment group (EG) and 16 subjects (5 women and 11 men) in the control group (CG). The sampling was non-random and from the non-probabilistic sampling category, the convenience criterion was used. All participants were informed about the content and purpose of the research and they gave their written consent for participation before the start of the study.

For collecting information on the employee's availability to participate in the study, a form was disseminated on the internal communication channels of the companies where the subjects came from. The form contained questions addressed to those interested in participating in this project. The subjects who expressed interest were selected and they accepted to take part in the measurements and the training. They consented on the use of the research results in exchange of anonymity guarantee.

The study was concluded between 1th of November 2016 and 5th of April 2017, period during which the subjects from the experimental group

participated in a tennis recreation program which consisted in 90-minute tennis lessons twice a week. During this time, the subjects from the control group continued their daily activities without taking an organized part in new activities involving physical exercise.

The research began with the initial evaluation of the physical fitness of the subjects through the application of the tests included in the Eurofit Test Battery for Adults (Council of Europe, 1995): sit-and-reach (coxo-femoral mobility), vertical-jump, bent-arm-hang (isometric force of the arms and shoulders), hand grip, single leg balance, plate-tapping (the speed of the limb movement) and the 20 m shuttle run (for the calculation of VO_2 max).

The data resulting from the measurements provided by the Eurofit Test Battery for Adults were statistically processed using the SPSS statistical analysis software, version 20. At first, the Shapiro-Wilk test was used in order verify the normality of the distribution and the descriptive analysis (means and standard deviation), followed by means comparison using parametric (T-test) and non-parametric tests (Wilcoxon and U Mann-Whitney) depending on the distribution of the data.

Results

The study participants (N = 43) were adults with ages between 23 and 38 years (28.95 ± 4.31), 60.46% male (n = 26) and 39.54% females (n = 17), all of them were employed in IT companies. The distribution within the experiment and the control group was based on the participants' choice.

The research started with the initial measurements, followed by the application of the proposed intervention program for a period of 4.5 months. At the end of the research, the final measurements took place in identical conditions with those from the initial testing.

Table 1. Means and standard deviations of the measured variables during initial and final testing

Variable	EG (n=27)		CG (n=16)	
	Initial testing M (±AS)	Final testing M (±AS)	Initial testing M (±AS)	Final testing M (±AS)
Flexibility (cm)	4.67(±7.7)	5.13(±7.76)	5.22(±6.1)	4.88(±6.14)
Balance (rep)	2.37(±2.73)	1.52(±1.16)	2(±1.15)	1.75(±0.86)
Plate-tapping (sec)	11.01(±1.74)	9.88(±1.37)	10.91(±1.46)	10.07(±1.13)
Vertical jump (cm)	50.78(±14.25)	46.04(±11.7)	49.63(±11.14)	46.81(±8.48)
Hand grip (kg)	42.11(±12.11)	45.37(±11.41)	46.75(±12.54)	46.81(±12.11)
Bent-arm-hang (sec)	23.79(±17.3)	28.84(±18.44)	29.83(±23.92)	31.15(±19.68)
20m Shuttle-run-test (level)	5.81(±2.02)	6.65(±2)	5.81(±2.74)	6.25(±2.02)
Relative VO_2 max (ml/kg/min)	35.56(±6.5)	38(±6.48)	31.88(±19.17)	36.21(±6.64)

The normality of the data distribution was verified using the Shapiro-Wilk Test; the results obtained correspond to those shown in Table 2. An analysis of this shows that not all measured data have a normal distribution, so both parametric and non-parametric tests are used to study the significance of the mean difference. Therefore, within the experimental group, the data were normally distributed in terms of flexibility variables, vertical-jump, dynamometry and bent-arm-hang, while within the control group the data concerning balance and VO2 max were not normally distributed.

Tabelul 2. Initial testing – normality of data distribution

Variable	Shapiro-Wilk test of normality			
	EG (n=27)		CG (n=16)	
	Statistic	p	Statistic	P
Flexibility (cm)	0.97	0.63	0.96	0.58
Balance (rep)	0.55	<0.001	0.79	0.002
Plate-tapping (sec)	0.87	0.003	0.92	0.15
Vertical jump (cm)	0.93	0.08	0.97	0.88
Hand grip (kg)	0.93	0.07	0.93	0.25
Bent-arm-hang (sec)	0.97	0.57	0.93	0.21
20m Shuttle-run-test (level)	0.92	0.03	0.95	0.45
Relative VO_2 max (ml/kg/min)	0.91	0.02	0.68	0.001

Taking into account the distribution of the data and the number of individuals, the significance of the difference between means in the case of variables with a normal distribution was analyzed using the parametric test T-test for paired samples and the non-parametric test Wilcoxon for variables which did not have a normal distribution. The comparative analysis of the significance of the differences for the paired samples is presented in table 3.

Table 3. Paired samples means comparison

Variable	EG (N=27)		CG (N=16)	
	t/Z	p	t/Z	p
Flexibility (cm)	-0.79*	0.44*	0.57*	0.58*
Balance (rep)	-2.43**	0.01**	-0.83**	0.41**
Plate-tapping (sec)	-4.46**	<0.001**	3.87*	0.01*
Vertical jump (cm)	2.04*	0.05*	1.87*	0.08*
Hand grip (kg)	-3.52*	0.02*	-0.06*	0.95*
Bent-arm-hang (sec)	-2.77*	0.01*	0.75*	0.46*
20m Shuttle-run-test (level)	-3.64**	<0.001**	0.17*	0.86*
Relative VO_2 max (ml/kg/min)	-3.68**	<0.001**	-0.5**	0.96**

* Paired samples T-test

**Wilcoxon test

According to Table 3, as regards the experimental group, significant differences can be observed between the two measurements of all variables, except for flexibility (t = -0.79, df = 25, p = 0.44). In the case of the control group, there were no significant differences between the mean of the initial and the final measurement aside from the plate-tapping test (t = 3.87, df = 14, p = 0.01).

At the end of the intervention, by the use of the Mann-Whitney test, the statistical significance of the differences between the means of the variables measured in the experimental and control groups was checked. From the results presented in Table 4, we can observe that there is a statistical significance between the means in the case of hand grip (U = 133.5, p = 0.04), bent-arm-hang test (U = 134.5, p = 0.04), shuttle-run-test (U = 98.5, p = 0.003) and VO2max (p = 0.002) after the intervention.

Table 4. U Mann Whitney test for independent samples means comparison

Variable	U	z	p
Flexibility (cm)	171	-1.14	0.25
Balance (rep)	192.5	-0.62	0.54
Plate-tapping (sec)	169.5	-1.17	0.24
Vertical jump (cm)	205.5	-0.26	0.79
Hand grip (kg)	133.5	-2.08	0.04
Bent-arm-hang (sec)	134.5	-2.05	0.04
20m Shuttle-run-test (level)	98.5	-3	0.003
Relative VO_2 max (ml/kg/min)	102	-3.03	0.002

Discussion

The general findings of similar research indicate that those who choose to practice tennis as a recreational leisure activity experienced positive benefits on their physical fitness and implicitly on their health. Lower body fat percentages, more favorable lipid profiles and improved aerobic capacity contributed to a generally smaller risk of cardiovascular morbidity (Pluim, Bonita, Marks, Miller, Miley, 2007). The same authors also outlined the results of numerous studies which identified better bone health, not only for tennis players which took part in tennis activities over the course of their lives, but also for those who started to practice tennis in adulthood.

The comparative analysis concerning the signification of the difference between the mean variables for the experimental group research shows that all variables, except flexibility (t = -0.79, p = 0.44), registered a significant difference between the initial and the final testing, whereas the only significant difference in the case of the control group is within the plate-tapping test (t = 3.87, p = 0.03).

The study also highlights the fact that the effect of a recreational tennis program depends on its duration and the duration of a training session. Comparing the results of this research with those of a previous one (Şerban & Baciu, 2017), we find that the effect of the intervention program extends to several evaluated variables. We mention that the research methodology of the present study underwent several changes. These changes include the following: for the calculation of the VO2 max, the 2 km walk test was replaced by the 20 m shuttle run, the duration of the intervention was extended from 6 weeks to 4.5 months, the duration of the training lesson was 90 minutes instead of 60, other technical elements and techniques were involved.

Comparing the results of the significance tests of the mean differences of the two studies, we note that there were statistical significance changes only in the case of sit-and-reach (p = 0.02) and hand grip abilities (p = 0.01) (p = 0.04) within the 2017 study, whereas the present study registered statistical significance developments in the case of the bent-arm-hang test (p = 0.04), shuttle run (p = 0.003) and VO2max (p = 0.002). For means of other variables, there is no statistical significance.

As regards the control groups of the two studies, it can be noticed that there were no statistically significant changes in the mean of the measurements, except for the plate-tapping test of the current study (p = 0.003).

Table 5. Results of the statistical signification tests for mean differences

Variable	Previous study (2017)			Present study (2019)		
	p (U M -W)[a]	p (W,GC)[b]	p (W,GE)[c]	p (U M-W)[a]	p (W, GC)[b]	p (W,GE)
Flexibility (cm)	0.02	0.10	0.001	0.25	0.55	0.34
Balance (rep)	0.40	1.00	0.04	0.54	0.41	0.01
Plate-tapping (sec)	0.09	0.07	0.001	0.24	0.003	0.001
Vertical jump (cm)	0.26	0.28	0.19	0.79	0.11	0.06
Hand grip (kg)	0.01	0.11	0.003	0.04	0.84	0.003
Bent-arm-hang (sec)	n.a.	n.a.	n.a.	0.04	0.46	0.01
20m Shuttle-run-test (level)	n.a.	n.a.	n.a.	0.003	0.75	0.001
Relative VO_2 max (ml/kg/min)	0.46	0.18	0.43	0.002	0.96	0.001

[a] - Postintervention U Mann-Whitney Test for independent samples
[b] - Wilcoxon Test for paired saples in the CG
[c] - Wilcoxon Test for paired saples in the EG

Conclusions

The analysis of the results registered in the current study revealed the presence of some statistically significant changes in the physical fitness indices of the subjects in the experimental group: balance (p = 0.01), plate-tapping test

($p < 0.001$), vertical-jump ($p = 0.05$), hand grip test ($p < 0.01$), bent-arm-hung ($p = 0.001$), shuttle run ($p < 0.001$) and aerobic resistance ($p < 0.001$).Thus, the hypothesis that the participation of individuals which carried out a sedentary activity at their workplace at a tennis practice program improved their physical fitness indices was confirmed. However, at the end of the study we reach the conclusion that differences between the means of the variables measured in the two research groups are not significant for flexibility, balance, coordination and vertical-jump.

Several difficulties were encountered in the carrying out this study: the number of participants was reduced due to the particularities of tennis training- for a good density of activity, a coach can manage at the same time a maximum of 6 players on a field; the relatively late hours at which the intervention was held, with workers being forced to start workouts after the work schedule and to finish them more quickly in order to be able to rest for the next day; costs are not to be neglected, but if such programs are supported by both employers and employees, they should not represent a major difficulty.

Considering the mentioned facts, we can conclude that such programs are useful and should be implemented in as many companies and business units as possible and the study new methods of implementing and conducting such interventions is necessary.

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STUDIA UBB EDUCATIO ARTIS GYMN., LXIV, 2, 2019, pp. 57 - 68
(RECOMMENDED CITATION)
DOI:10.24193/subbeag.64(2).15

CHANGES OF PELVIC FLOOR MUSCLE FUNCTION DURING PREGNANCY

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ABSTRACT. ***Objective:*** It is known, that incontinence rarely develops during pregnancy. The authors examined pelvic floor muscle function changes during pregnancy. ***Study Design*****:** Authors examined 156 women and performed vaginal squeeze pressure measurements. Statistical data were analyzed by *t*-test, differences were considered to be significant at $p<0.05$. ***Results****:* Significant difference was found concerning maximum voluntary contraction ($p=0.002$) and duration of maximum muscle contraction ($p=0.012$) in young nulliparous women compared to average results of pregnant women. This result can be proved in young nulliparous women and among pregnant women in the 2nd ($p=0.045$), and 3rd trimesters ($p=0.005$). Comparing only the results of pregnant women a significantly decreased pelvic floor muscle strength was observed ($p=0.032$) in women exercising occasionally. Significantly weaker muscle strength was demonstrated in those young nulliparous women ($n=21$) who experienced vaginal wind ($p=0.003$) than in young nulliparous women without symptoms. ***Conclusions*****:** Vaginal contraction strength decreases during pregnancy.

Keywords: *pelvic floor muscle strength, endurance, vaginal wind, pregnancy*

Introduction

Pelvic floor muscles (PFM) may be exposed to alterations during the different phases of a woman's life, such as pregnancy, postpartum period, and menopause. These factors can impair the integrity of the PFM and lead to urinary incontinence (UI) (Amaro, Moreira, Gameiro et al., 2005). Vaginal delivery is the

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most important risk factor and it has been associated with a decrease in PFM strength of 22-35%, after delivery (Sampselle, 1990). Numerous articles deal with the different types of childbirth (Caesarean section, spontaneous vaginal-, forceps- or vacuum assisted delivery) and their results show that spontaneous vaginal- and instrument assisted deliveries increase the frequency of incontinence (Farrell et al, 2001; Peschers et al., 2003; Arya et al.,2001; Rortveit et al., 2003).

Burgio et al. found on the basis of a prospective non-randomized trial results that incontinence rarely develops during the postpartum period and incontinence problems do not start after delivery but actually during the pregnancy (previous) and endures also after delivery (Burgio, Zyczynski, Locher et al, 2003). In the other study group urinary incontinence during pregnancy with a range of 18.7-22.6% was reported (Borello-France, Burgio, Richter et al., 2006). Meyer et al. found 31% of stress urinary incontinence (SI) frequency during pregnancy and in 60% of it SI already occurred during the 2nd trimester (Meyer, Schreyer, De Grandi et al., 1998). The prevalence of incontinence before pregnancy increased from 26% to 58% in the 30th week of pregnancy. Stress urinary incontinence was the most common type of incontinence in the 30th week of gestation, experienced by 31% of nulliparous and 42% of parous women (Vesnes, Rortveit, Bo et al., 2007).

The subjective evaluation of PFM showed a significant decrease in muscular strength during pregnancy but in the objective evaluation there was a not significant decrease of PFM strength compared to healthy nulliparous subjects (Amaro, Gameiro, Sousa et al., 2010). According to Scheer the support of the pelvic organs significantly weakens following the first vaginal delivery, but not during pregnancy (Scheer, Thakar, Sultan et al., 2007). In contrast, according to Gameiro, transvaginal digital palpation evaluation showed significant impairments of the pelvic floor muscle strength at the 36th week of gestation (Gameiro, Sousa, Gameiro et al., 2011). Not enough exact information is available about pelvic floor muscle function changes during pregnancy (Manson, Rose, Wrong et al., 2010).

It is known, that stress incontinence more often appears in women who perform strenuous physical activity (Nygaard et al., 1994; Thyssen et al., 2002; Bo, Borgen, 2001). But it is unknown, what effect the moderate physical activity on the strength of PFM during pregnancy.

Question to be answered is: is there a change and how intense it is among the results of pregnant women of the 2nd and 3rd trimesters. Besides, to reveal how PFM strength changes are influenced by physical activity during pregnancy.

Material and methods

Participants

To be eligible, participants had to be younger than 35 years, at least in the 12th week of the present gestation and willing to participate in the study.

Altogether, 156 examinations were carried out among young nulliparous-, and pregnant women, measurement data were processed in the current article. The catchment areas involved only Caucasian women to participate if 18 or over, nulliparous with a known singleton pregnancy and no previous symptoms of stress incontinence.

In the current study excluding factors were as follows: smoking, allergy, pulmonary diseases, previous surgery, radiotherapy, chronic urinary tract infection, severe neurology disease e.g. multiple sclerosis, muscular dystrophy, psychiatric disease, or major medical condition, regular pelvic floor exercise, inability to contract the pelvic floor muscle, strenuous physical work and multipara women. Women with pregnancy complications (twin gestation, diabetes, preterm labour, and haemorrhage from low-lying placenta) were also excluded. All subjects of the study were voluntaries and provided informed consent.

The intervention

Vaginal squeeze pressure measurement was performed with Gynopress (Frytech Ltd., Budapest, Hungary) to determine the muscle function; women were in lithotomy position during the examination. The intravaginal air-inflated balloon catheter used for the examination had the following parameters: length 75mm, diameter 15mm, connected to a microtip transducer. The balloon catheter was covered with a non-lubricated condom and with the help of a syringe filled with 35 ml air. Subjects were well-informed about the procedure before the examination and visual control of techniques was ensured during the examination. The pressure balloon was inserted into the vagina until the full extent of the compressible portion of the device was above the level of the hymeneal ring. The perineometer was connected to a handheld microprocessor with latex tubing, allowing the readings of pressure values in centimetres of water (cmH_2O). On examination of the muscle group the results of maximum muscle strength and duration of maximum muscle strength were processed. For each squeeze, a maximum pressure and duration of squeeze were considered as strength and endurance of the PFM. Patients were instructed to contract their PFM and to squeeze with maximum effort. They were asked to pull the PFM in and up as much as possible. Three adequate squeezes were recorded with 60-second rest intervals between efforts. The peak of the three successful contractions was recorded as maximum strength of PFM. The examination of endurance indicated the duration of maximum muscle contraction. In order to measure the endurance, 75% of maximum perceived strength was calculated. Patients were then instructed to maintain this squeeze pressure until fatigue developed or the squeeze pressure returned to

75% of the primary effort. The same person performed the examination under undisturbed conditions in every case. On examination of muscle strength, the maximum voluntary contraction was examined and results of not satisfactory measurements were closed out which involved breathing manoeuvres (Vasalva manoeuvre or voluntary apnoea) and contracting the gluteal, hip adductor, or abdominal muscle instead of the pelvic floor muscle.

Questionnaires were always filled in by the same person before the survey started. The first part of the questionnaire included demographic data, obstetric and gynaecological history and current medication, the second part involved questions related to lifestyle and risk factors. The third part dealt with exercise habits. The exercise type was asked and recorded according to frequency. Physical exercise at least 2 times/1hour was considered to be regular, less frequent exercise was considered to be occasional (once a week, or less and less than 1 hour).

The whole examination period involved 13 months. The examinations were carried out at the Department of Obstetrics and Gynaecology, Faculty of Medicine, University of Pécs, and Institute of Physiotherapy and Sport Sciences, Faculty of Health Sciences, University of Pécs.

Procedure

Ethical considerations

The study was approved by the appropriate research ethics committee in University of Pécs. (Licence No. 4590) Women received an information sheet prior to attending their vaginal squeeze pressure measurement. If they were interested in participating in the research, the physiotherapist provided a detailed explanation. Those who agreed to participate signed an informed consent.

Statistical Methods

The study was a prospective, observational and a controlled trial with non-random sampling. Variables are described by frequencies and mean and standard deviation or mean and range.

Statistical data were analyzed by *t*-test or nonparametric Mann-Whiney *U*-test was used to compare the difference between groups. Differences between nonmetric variables were analyzed using Fisher's exact test. A p value <0.05 was interpreted as statistically significant. Statistical analysis was performed using SPSS 15.0.1 for Windows (SPSS Inc, 1989–2006).

Results

Statistical Characteristics of the Participants

Demographic parameters of surveyed women were as follows: the first group involved young nulliparous women: number of examined women 52, the second group involved pregnant women in the 2nd (13-26 weeks) and 3rd (26-39 weeks) trimesters. The number of examined pregnant women is 104, average week of pregnancy: 28.6 weeks (13-39 weeks).

Table 1. Statistical Characteristics of the Participants

	Age (years)	BMI (kg/m^2)
Young Nulliparous Women (n=52)	23.38 ±2.52 (21-30)	21.22±1.8(17.78-25.8)
Young Nulliparous Women (n=21) with the complaint	21.38 ±2.33(21-27)	20.11±1.6(17.78-22.8)
Pregnant Women (n=104)	28.84±2.89 (22-35)	23,33±2.6(18.98-26.8)
2nd trimester (n=52)	26.8±1.89 (23-35)	21.03±1.79(18.98-22.01)
3rd trimester (n=52)	27.01±2.99 (22-33)	24.67±3.11(19.92-26.8)

Findings of PFM function

A significant decrease could be observed between mean muscle strength and duration of maximum muscle contraction of young nulliparous women compared to average muscle strength (p=0.002) and duration of maximum muscle contraction (p=0.012) during pregnancy. This is also verified by the results of the current study regarding muscle strength and muscle strength of young nulliparous women (p=0.005) as they showed a significant decrease in pregnant women during the 3rd trimester.

Table 2. Values of PFM strength and duration in the third trimester and in nulliparous women

	Third trimester patients (n=52)	Nulliparous controls (n=52)	p value
Maximum contraction strength (cmH_2O)	mean 64.6±SD 42.98 range 6-150	mean 93.13 ±SD 43.12 range 19-180	0.005
Maximum contraction duration (sec)	mean 3.65±SD 1.93 range 1-10	mean 6.33±SD 3.89 range 1-13	0.003

Further analysis of the results of young nulliparous women and the 2nd trimester a significant decrease of muscle strength (p=0.045) was proved even in this trimester.

Table 3. Values of PFM strength and duration in the second trimester and in nulliparous women

	Second trimester patients (n=52)	Nulliparous controls (n=52)	p value
Maximum contraction strength (cmH_2O)	mean 79.58±SD 35.82 range: 4-160	mean 93.13±SD 43.12 range 19-180	0.045
Maximum contraction duration (sec)	mean 5.47±SD 5.8 range 1-17	mean 6.33±SD 3.89 range 1-13	0.122

In the 3rd trimester not only muscle strength but also duration of maximum muscle contraction (p=0.003) showed essential differences compared to duration of maximum muscle contraction of young nulliparous women while in the 2nd trimester duration of maximum muscle contraction did not show any significant differences (p=0.122). Comparing the data of the 2nd and 3rd trimesters the following can be concluded: average muscle strength in the 2nd trimester is higher than in the 3rd but no significant difference could be defined (p=0.441). Duration of maximum muscle contraction was better by 0.831 sec (p=0.516) but statistically it was not significant.

Table 4. Values of PFM strength and duration in the second and third trimesters

	Second trimester patients (n=52)	Third trimester patients (n= 52)	p value
Maximum contraction strength (cmH_2O)	mean 79.58±SD 35.82 range: 4-160	mean 64.6±SD 42.98 range 6-150	0.441
Maximum contraction duration (sec)	mean 5.47±SD 5.8 range 1-17	mean 3.65±SD 1.93 range 1-10	0.516

When habits of exercise were taken into consideration in the analysis the following results were obtained: further on much better results of muscle strength (p=0.03) were obtained if young nulliparous women performed regular exercises when compared to pregnant women. The pelvic floor muscle strength (p=0.029) of those young nulliparous women who occasionally did exercise and the duration of maximum contraction (p=0.018) of young nulliparous women who regularly did exercise showed a significantly better result when compared to those pregnant women who regularly or occasionally did exercise. Comparing only the results of pregnant women a significantly decreased pelvic floor muscle strength was observed (p=0.032) in women exercising occasionally versus regularly. Subjects of this study preferred the following exercise types: running, ball games, aerobic, maternity exercise, aqua-fitness and jogging. Due to the small case number the effects of physical activity types on pelvic floor muscle strength was not examined in further.

Although it was not the purpose of the investigation, it was found that muscle strength showed a significant difference in young nulliparous women who experienced vaginal wind (p=0.003), compared to those without the complaint.

Discussion

Mechanical and hormonal factors due to pregnancy can predispose women to decrease PFM strength (Gameiro et al., 2011). Summary of present results shows a significant decrease in muscle strength and duration of maximum muscle contraction of pregnant women. Significant change due to physiological changes of the last period in pregnancy is observable when muscle strength of young nulliparous women and pregnant women in the 3rd trimester were compared. It is known, that the growing uterus and foetus weight on PFM, which contributes to chronic stress on PFM throughout pregnancy and results in PFM weakness. Sphincter strength and its supportive function of PFM are at risk. The present findings show, that significant decrease of muscle strength was statistically proven in pregnant women in the 2nd trimester too. When the average results of the two trimesters were compared a smaller but not significant decrease of muscle strength was probably due to displacement of centre of gravity which resulted from the increased lumbar lordosis (Nguyen, Lind, Choe, et al., 2000). The intense growth of the foetus in the 3rd trimester may cause an increased lordosis and the downward force loads not only the pelvic floor muscle but the pubic bone and the abdominal muscles as well (Capson, Nashed, Mclean, 2011). The effect of hormonal changes may be more significant in the PFM strength maintaining, as to mechanical stresses during pregnancy (Hvidman, Foldspang, Mommsen, et al., 2002).

Change of function is observable when duration of maximum muscle contraction of young nulliparous women and pregnant women in the 3rd trimester was compared. Gameiro et al. observed a significantly shorter contraction time in the primiparous women who underwent caesarean deliveries compared to the nulliparous women. According to the authors one possible explanation is that compromising the rectus abdominis muscle during caesarean delivery impairs the sustained contraction of the PFM and reduces the contraction time (Gameiro, Sousa, Gameiro, et al., 2011). At present, in spite of the accumulating knowledge about the co-coordination between involved muscles (abdominal muscles, deep back muscles, diaphragm and the perineal muscles) (Madill, McLean, 2008) in maintaining continence, little is known about the change of this function during pregnancy, but we know, that the abdominal muscle strengthening can be beneficial (Dimpfl, Jaeger, Mueller-Felber, et al., 1998). The other hand, the pelvic floor is composed of a combination of slow-twitch or type I (66%) and

fast-twitch or type II (34%) muscle fibre (Dimpfl, Jaeger, Mueller-Felber, et al., 1998). The slow-twitch fibres are responsible for maintenance of the tone of the levator any muscles, providing support for the pelvic organs at rest. The fast-twitch fibres are mainly activated during stressful periods or sudden increases in intra-abdominal pressure (Dixon, Gosling, 1994). It is known, that type II or fast twitch fibres predominantly generate energy anaerobically for a quick and powerful contraction, and exert 20% more force than slow-fibres (Powers, Howley, 2007). This function may impairment and the pelvic floor muscle strength decreases at the 36th week of gestation (Gameiro, Sousa, Gameiro, et al., 2011). Findings of present study are in accordance with this previous finding. It is known, that PFM has a higher percentage of slow-fibres to maintain its tone and contraction (Peruchini, DeLancey, 2008). Type I fibers are characterized by high endurance. Research has shown that type I or slow-fibers decrease in the levator any after birth (Dimpft, Müller-Felber, Anthuber, 1996). Present result shows decline already during third trimester. Not enough exact information is available, further studies are needed about pelvic floor muscle function changes during pregnancy particular as regards type I or slow-fibres concerned.

Six factors affect the development and maintenance of muscle mass: nervous system activation, environmental factors, endocrine influences, nutritional status, genetics and physical activity. All are relevant to the structure and function of PFM (McArdle, Katch, Katch, 1991).

It is known, that stress incontinence more often appears in women who perform high strain jobs, intense jumping, high-intensity sports and heavy lifting (Nygaard et al., 1994; Thyssen et al., 2002; Bo, Borgen, 2001). The frequency of physical exercise also gives a significant difference in the results between the groups which encourages us to suggest the continuous, regular but not straining physical exercise during pregnancy as well as the Royal College of Obstetricians and Gynaecologists and Guidelines (Royal College of Obstetricians and Gynaecologists, 2008).

In a detailed interview, we questioned bladder (stress and urge incontinence, frequency, nocturia, symptoms of voiding dysfunction, and urinary tract infections) and bowel symptoms (straining at stool and chronic constipation), as well as a history of conditions associated with connective tissue dysfunction and pelvic floor muscle exercises. It is not unusual for women to experience vaginal noise (VN) or vaginal wind (VW), especially during posture changes and sexual intercourse. The underlying mechanism of VN is still unknown. It is possible that air becomes trapped in the posterior fornix and that during sudden movements it is released and produces the typical noise (Hadar, Kornreich, Heifettz, et al., 1991). Approximately one out of the eight women in a general population had the symptom of VN. According to Krissi et al. VN is an

extremely embarrassing problem (Krissi, Medina, Stanton, 2003). Slieker-ten Hove et al. found no significant differences in the strength and endurance of the pelvic floor musculature between the VN positive and the VN negative women in contrast to the results of present study (Slieker-ten Hove, Pool-Goudzwaard, Eijkemans, Steegers-Theunissen, Burger, Vierhout, 2009). In the present study, the muscle strength showed a significant decrease on examination of pelvic floor muscle strength in young nulliparous women with the complaint of vaginal noise. It is known, that the pregnancy itself and hereditary factors might predispose more than parturition trauma in some women (Demirci, Ozden, Alpay, et al. , 2001; Foldspang, Mommsen , Djurhuus, 1999; Iosif, Batra, et al., 1981; Iosif, 1981) but the exact mechanisms remain uncertain. Initial strength of PFM is another factor that may influence continence status during pregnancy (Morkved, Salvesen, Bo, et al., 2004). Genetic factors and race influence the percentage distribution of type I or II fibres and this differs significantly among individuals, but studies have shown that specific training can convert type I to type II fibres, or vice versa (McArdle, Katch, F., Katch, C., 1991).

Relevance to clinical practice

There is not enough information available on physiological changes of the pelvic floor muscle strength during pregnancy to prevent stress incontinence. These data provide further justification, but on the basis of these present results it is questioned that preventive programmes (pelvic floor exercise) should preferably be started earlier. It appears that healthcare professionals, midwives and physiotherapists should evaluate women in terms of their pelvic floor muscle function already at the beginning of the pregnancy. It is hoped, that this work will eventually lead toward reasonable strategies to reduce the incidence of pelvic floor dysfunction.

Strength and weaknesses of the study

This current study had some limitations which must be considered, firstly, the small number of subjects in each group. Secondly, women were not followed through their pregnancy and the post-partum period. Finally, the methodological weakness in the design of the study was that vaginal squeeze pressure measurement is the most sensitive method of assessing PFM strength although not the most reliable one, but it is the most accessible and affordable currently. A new study should be carried out to compare all periods (before gestation, first, second, third trimesters and the postpartum period) and control other factors, such as lumbar lordosis, abdominal-, gluteal- and back muscle strength, the changes developing during gestation.

The strengths of this study lie in the setting and design. The study was a nonrandomized controlled clinical and population-based cross-sectional study with an age- and sex-matched control group. The strength of the study is the fact that few studies have been made in this area, especially on the state of the perineal muscles during pregnancy. The primary benefit of the research is that not only muscle strength but endurance is investigated during the 2nd and the 3rd trimester. The measurement method has great importance. The patients had received adequate information prior to the examination in order to prevent measurement errors. The measurements were performed by the same experienced colleague. One of the key components of the research is examining physical activity and pelvic floor muscle strength during pregnancy. It has been revealed little in the literature so far. The primary objective of the study did not include the detection of PFM dysfunction for nulliparous women. During the interview, the survey focused primarily on the exclusion and inclusion criteria factors for nulliparous women. However, in the interviews a vaginal noise was mentioned by the participants, which is not among the recognized symptoms so those women were not excluded from the study. Statistical analyses were conducted with the unexpected but significant outcome of the investigation.

Conclusions

Pregnant women had more significant weaker pelvic floor muscle strength in the 2nd and 3rd trimester than young nulliparous women. The continuous and regular, but not strenuous exercise does not impair the strength of the PFM during pregnancy. In young nulliparous women who experienced vaginal wind PFM function may be decreased.

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STUDIA UBB EDUCATIO ARTIS GYMN., LXIV, 2, 2019, pp. 69 - 80
(RECOMMENDED CITATION)
DOI:10.24193/subbeag.64(2).16

INTRODUCING ADVENTURE EDUCATION ACTIVITIES IN PHYSICAL EDUCATION LESSONS

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ABSTRACT. Adventure education activities are used in many countries as a mean for interpersonal and intrapersonal development. The activities have a great appeal to children and teenagers, and, because of their identified benefits, have been introduced, in several forms, in schools around the world. Navigation and rope courses are often used as part of the programs of adventure education. One of the methods of introducing adventure education in schools is through the physical education lessons. Because we consider that students from Romania could also benefit from these activities we have built a pilot adventure education program, selecting and adapting activities so that they fit the Romanian physical education requirements.

Keywords: *adventure education, physical education, initiatives, low rope courses, orienteering*

REZUMAT. ***Introducerea activităților specifice educației prin aventură în lecția de educație fizică*.** Activitățile specifice educației prin aventură sunt folosite în multe țări ca mijloc de dezvoltare interpersonală și intrapersonală. Activitățiile îi atrag pe copii și tineri, și, datorită beneficiilor identificate, au fost introduse sub diferite forme în școli din întrega lume. Orientarea și traseele de frânghii sunt adesea folosite ca parte a programelor de educație prin aventură. Una din căile prin care educația prin aventură este introdusă în școli este lecția de educație fizică. Pentru că considerăm că elevii din România ar putea și ei să beneficieze de pe urma acestor activități, am construit un program de educație prin aventură pilot, selectând și adaptând activități astfel încât acestea să se potrivească cu cerințele pe care sistemul românesc le are din parte educației fizice.

Cuvinte cheie: *educație prin aventură, educație fizică, inițiative, trasee suspendate de frânghii, orientare sportivă*

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Introduction

Adventure Education is a form of experiential learning (Walsh & Aubry, 2007; Ewert & Sibthorp, 2014, Raiola & O'Keefe, 1999) aimed at interpersonal and intrapersonal development. Adventure Education uses risk and adventurous activities and is thought to have been influenced by sociology, psychology, progressive education, organized camping and wilderness expeditions (Daniel, 2009). Hammerman considers that the principles of adventure education are inspired from Comenius, that insisted on the use of senses in learning, Rousseau, who was talking about learning based on natural principles, and Pestatlozzi, who considered the use of practical skills to be very important in the learning process (Hammerman, 1980, as cited in Raiola & O'Keefe, 1999). Research shows that this form of education has proven successful at developing skills like communication, teamwork, leadership as well as aspects of the self-concept (Hattie, Marsh, Neil & Richards, 1997, Casson & Gillis, 1994, Kellert, 1998).

Adventure education in school

Introducing Adventure Education in school is not a new concept. In USA the introduction of adventure education in schools at a large scale started in 1971 with the program Project Adventure, that was adopted by more than 400 schools in the first 10 years (Prouty, 1999), in UK was introduced after 1974, initially just as a method to help students with poor academics or social skills (Loynes, 1999), and in Australia reached almost all the schools by the 1980's, becoming a compulsory component of the curriculum in quite many of them (Pickett & Polley, 2001). Even though when the first programs were introduced they contained interdisciplinary lessons as well (Raiola & O'Keefe, 1999), most of the adventure programs developed in schools are implemented incorporated into the physical education lessons (Evans, 2000, Proudman, 1999).

The main source of inspiration for Adventure Education programs is Project Adventure, a program launched in US that uses initiatives, rock climbing, and rope courses (Raiola & O'Keefe, 1999, Prouty, 1999). In 2002 there were over 2500 schools in the world that were implementing a version of this program (Panicucci, 2002). The program is aligned with the US national standards for physical education and the main objectives are: learning new motor skills, develop a social acceptable behavior, develop personal responsibility, respect for diversity and development of abilities and skills related to social integration, problem solving, decisions making and objectives setting (Panicucci, 2002).

There is a large variation of programs across the world, with some schools opting for extended wilderness camps of up to 20 weeks (Gray &

Patterson, 1994), others for regular weekly activities, usually incorporated in regular PE lessons (Baena-Extremera, Banos & Garcia, 2013, Tischler, 2012). There is no consensus on what variation is better, but specialists agree that the longer programs are more effective (Neill, 2002, Cason & Gillis, 1994).

Programs will also be constructed in different ways, with some schools building their program around the lead teacher, like Apex school that has a program of 57 days of activities grouped in 9 units of various length (Tischler, 2012), others making the most of their location, like Aiglon College, in Switzerland, that has a program based on mountain expeditions (Aiglon, 2014), and some others adapting the activities to the space and resources available in school (Baena-Extremera et al., 2013, Dejager, 2006, Hammes, 2007).

Adventure education activities that are suitable for physical education lessons

There is no agreement on what might be the most effective type of activity for adventure education, but some important characteristics have been identified, like the fact that they must present a challenge and have a clear end (Walsh & Golins, 1976), or that the participants should face new situations (Lukner & Nadler, 1997, as cited in Sibthorp, 2000). Horwood (1999) was saying that an activity could be considered as part of adventure education if it has some risk, physical or psychological, the result is uncertain, the consequences cannot be avoided, and it requires active participation. Some specialists consider that the physical strain is the most important aspect (Gass, 1995, Ewert & Sibthorp, 2014), but the participants need to be also under mental and emotional stress (Walsh & Golins, 1976), however load should be progressive (Walsh & Golins, 1976, Ewert & Sibthorp, 2014). A study done by Bisson (1998) has shown that the success of the program is related to the order of the activities, but the specialists agree that the same order might not be suitable to every group (Bisson, 1999).

Examples of activities used for adventure education are rock climbing, abseiling, high rope courses, hiking, mountain biking, horse riding, canoeing, navigation, camping, orienteering, caving, ski touring but also games, initiatives or cooperative activities (Ewert & Sibthorp, 2014, Moote & Wodarski, 1997, V. Walsh & Golins, 1976). While some schools are able to take the students on regular high adventure activities, a large number of programs are focusing on taking the students camping and hiking for their adventure education programs (Marino, 2013, Patterson, 2011), and Furman (2011) even mentions that hiking might actually be the most often used activity. High adventure

activities, even though spectacular, require access to specialists, equipment and transport to appropriate locations, three aspects that usually comes with costs. In the same time, high adventure activities will also have higher risks, something that most schools like to avoid. A study done by Evans (2000) in California said that 50% of the school programs of adventure education were based on hiking, initiatives, rope courses and rock climbing. The term Rope Courses is used to describe a whole category of activities that includes icebreakers, activities to loosen up, games, trust activities, group tasks called initiatives as well as elements made of rope and wood and set at different heights above the ground (Rohnke, 1989). Rope courses seem to be the preferred type of activity for adventure education programs done in the urban setting (Priest & Gass, 1997, apud Furman, 2011).

Adventure education activities and physical education requirements

Based on the Romanian curriculum, the main objective of physical education is to develop bio-psiho-motor skills and competences that will help the students develop well, maintain good health, be able to handle the requirements of their job and integrate in society (Ministerul Educației Naționale, 2009, 2017). Studies show that adventure education programs bring a wide range of benefits to the participants both interpersonal and intrapersonal in nature (Hattie, et al., 1997, Casson & Gillis, 1994, Kellert, 1998). This skills and competences will later help the participants in their everyday life including work or social situations. In the same time adventure education is based on a large number of activities, mostly done outdoors, that can become long time habits with an intense impact on the health and wellbeing of the participant.

Regarding the general competences aimed for, the curriculum of physical education mentions: specific language development; the ability to use methods, means and knowledge in order to maintain good health, improve fitness level and learn specific skills; proper group behavior as well as respect and understanding for sport rules and regulations; the ability to express emotions and ideas through movement (Ministerul Educației Naționale, 2009, 2017). Adventure education activities seem to fit well with the objectives stated by the Ministery of Education. Adventure activities usually require participants to be part of a team, and the specific games and the initiatives are activities designed to encourage and develop teamwork, communication and other social skills (Priest, 1998, Goldenberg, Klenosky, O'Leary & Templin, 2000). Regarding other benefits, there are several studies that show that programs based on adventure education were successful in diminishing

antisocial behavior (Walsh & Aubry, 2007, West & Crompton, 2001, Lubans et al., 2012), positively influence moral behavior (Conrad & Hedin, 1985, Smith, Strand & Bunting, 2002) and develop responsible attitudes and behaviors (Gray & Patterson, 1994, White, 2012, American Institutes for Research, 2005). When it comes to the impact on motor development, even though some initiatives can be static, most of the activities used by adventure education can be quite demanding from a fitness point of view. There is little research that analyses the impact of adventure education programs on the fitness or motor development of the participants (Gehris, Myers & Whitaker, 2012, Gillis & Speelman, 2008, Ewert & Sibthorp, 2014), but participants do feel that the programs help them in this direction (Goldenberg, McAvoy & Klenosky, 2005). These kinds of programs develop social skills and have a strong positive impact on self-concept, but taking part in the activities also requires the learning and development of several motor skills as well, especially basic skills or skills categorized by the Romanian curriculum as "applicative utility skills".

Building our adventure education program

The adventure education curriculum planned was indented as a tool that will develop the interpersonal skills of the students while it will also contribute to the development of some fitness components. Fitness development was an important objective of the program, as the intention was to implement it during physical education lessons, so for our program we considered the potential impact on fitness and motor development of the selected activities. For this reason, when we selected the activities we considered their contribution to the development of interpersonal skills but also their impact on balance, arm strength or cardiovascular endurance. In some cases adaptation had to be made to the activities in order for them to engage the students more in ways that will benefit our purpose.

For a better understanding of the impact of the adventure activities, the main author has taken part in several activities and has engaged in discussion with foreign and domestic teachers and trainers engaged in delivering such programs. The practical experience was very important in determining the level of fitness required by different types of activities.

The final program of activities was comprised of specific games, initiatives, high rope elements adapted as initiatives, and orienteering activities and can be seen in **Table 1**.

The games were used at the beginning of the lessons to activate the students and get their body prepared for effort. Most of the games required the students to work as one team, or split into groups, and as such contributed

to the development of social skills. Examples of games are "Balloon Frantic" (Rohnke, 1984), where the students must keep several balloons in the air in the same time, or "Ready Aim…" (Rohnke & Butler, 1995), where the students work in pairs and try to hit other pairs while blindfolded.

The main part of our program was made out of **initiatives**, which are problems or chalanges for which the participnats need to find a solution. Our activities required pair work or group work at first, and then later engaged the whole class in the same time. The size of the gym and the resources available guided our choice of activities and in several cases we had to adapt them to our needs by splitting the students in smaller groups, increasing or decreasing the difficulty of the task or even changing the main objective. To give a few examples, for the „Spyder Web" (Rohnke, 1984) we used hoops attached to a suspended rope, when playing „Key Punch" (Rohnke & Butler, 1995) we used letters and had the students write their name by stepping on them, and the „Tower of Hanoi" problem was inspired from IT lessons. The main tasks of the activies were to take the group across different surfaces using set scenarios, rules and materials, to squeeze the whole group on a small surfaces, to get them to syncronize while performing some actions or to split tasks and responsabilities for a more effective solution. Most of the initiatives have multiple solutions that are not necesarly obvious, pushing the students to use critical thinking and they also create multiple oportunities for leadership.

The ***high rope elements*** are fixed suspended obstacles that need to be crossed over by the participants. The high rope elements were inspired from adventure parks, but were adapted to the space available and the objectives of our program., but considering that our program was focused on interpersonal skills, one of the key changes we have done to the elements was to make the students build them and then work together to keep them in position while their colleagues take turns crossing over. This change transformed the elements into initiatives and also allowed all the students to work on their arm strength longer during the lesson. As in the case of initiatives there are multiple solutions to each problem and the students had to sometimes find several of them in order to get everybody across or to spend more than an hour on one scenario in order to find an effective solution.

To guide the students to build different elements, for every activity they had only certain materials available. Resources used to build the elements were: vaults, usually used as starting and ending points for the crossing; ropes, that either had to used to cross over or to support the "bridges" into position; gymnastic mats piled together, again as starting or finishing point; gymnastic benches, rope or wooden ladders and small mats, all to be used as a mean to get to the other side. In some cases the ropes were attached to metal rings in the ceiling or the gymnastics wall bars, as a set part of the element, or other

resources were placed into preset positions. Large landing mats were used to protect the students from injury and mark the area that needs to be crossed over. Some of the elements built were the Cat Walk, Indian Bridge, Fidget Ladder, Two Line Bridge, Kitten Crawl, Commando Crawl or Tension traverse.

Orienteering is already recognized as a sport and is accepted as an optional activity in the Romanian curriculum for physical education. Orienteering is best done outside, using the school courtyard, the parks, or a wooded area around the school. In fact the whole neighborhood can be used for orienteering activities and Proudman (1999) recommends using map and compass navigation skills for city exploration, but we need to be aware of the safety issues related to this kind of activities. Orienteering activities could also be done inside the school, but running up and down the stairs could become a problem.

For our program, which can be seen in **Table 1**, we used activities and games related to map navigation and spatial orientation inspired from books as well as previous experiences of the authors. To align them with our program objectives we had the students work in groups or pairs. In this activities the students had to draw the map of an area, mark checkpoints and landmarks on a map, identify specific locations or navigate courses of 2 to 7 posts. The activities started in the courtyard and then moved in a park found close by. Before allowing the students to navigate the park, a lesson was used to show them the boundary of the used space and identify potential dangers that should be avoided. At the end of the program, a city navigation activity was also organized, were the students traveled in small groups trying reach several city landmarks.

Table 1. Organization of our adventure education program

Week (month)	Activities / Experiences
1 (Sep)	Orienteering countries game.
2 (Sep)	The students need to explore the courtyard and draw a map of it on a paper that already has the outline on it. The drawn maps are discussed in order to identify what things should apear on a map and what things should not
3 (Sep)	The students need to place cones on specific locations of the basketball court as fast as posible. The locations are taken from a map. Using a school map, all the students move in group to identify locations marked on the map. Discussion on how to identify them.
4 (Sep)	Run with the teacher around the park to establish the boundry of the space used for orienteering activities, to identify possible hazards and risks, and establish safety measures. Explain the orienteering map. Based on the map, the students are guided to identify specific objects on the map and then in real life.
5 (Oct)	1 post courses. As they return the teams receive other maps with posts on them.
6 (Oct)	Group navigation using park maps. This time they get 2 posts on every map. As they return they receive other maps. Discussion on posts difficult to find.

Week (month)	Activities / Experiences
7 (Oct)	Group navigation on a course with 6 posts. The groups leave at different intervals.
8 (Nov)	Mine field; Ready aim; Touch my can;
9 (Nov)	Monarch tag; Birthday Shuffle; The turnstile;
10 (Nov)	Baloon frantic; Balloon Trolleys, Trolley; Jelly Roll;
11 (Nov)	Barf ball; Group Juggling; Squash Balls
12 (Dec)	Two in a row; Key Punch
13 (Dec)	Bumper cars; Wild Woosey; Knots
14 (Dec)	Circle the circle; Playpen, both in original and adapted version; Blind forms;
15 (Jan)	X and O; Hanoi Towers;
16 (Jan)	Yourt Circle; Human ladder; Write your name
17 (Jan)	Everybody Up; Mohawk Walk
18 (Jan)	All Aboard; Prouty's Landing:
19 (Feb)	Stepping Stones; Magic carpet, in adapted version;
20 (Feb)	Add on tag/ blob tag; Welded ankles, done with arms locked at first and then in original version;
21 (Feb)	Walking on boards; Zig-zag; Islands
22 (Mar)	Help me tag; Nuclear fence
23 (Mar)	Transformer tag; Spider web;
24 (Mar)	Rope jousting; Adapted high elements;
25 (Mar)	Adapted high elements;
26 (Apr)	Adapted high elements;
27 (Apr)	Object retrieval; Tug of war
28 (May)	Moonball; Italian golf
29 (May)	Chicken baseball; Pigs in a blanket
30 (May)	Compass walk; Large group navigation on a course with 7-8 posts with a map, with the students discussing their decisions as we move around.
31 (May)	Working in small groups (3-4), the students need to mark on the map a post they place in the park and then get back to start. Every team gets to check the placement of posts of other teams. At the end the whole group travels to reach all the posts and discussions are generated.
32 (May)	Navigation in pairs on a course with 6-8 posts using a map that has the order of the posts marked on it. The pairs leave at different time intervals.
33 (Jun)	Navigation in pairs, using a map, on a course with 6-8 posts that can be approach in any order.
34 (Jun)	Every pair places a post in the park and marks it on a map. Every pair will need to mark on their map the location of the posts placed by other paris and then navigate to find them all.
35 (Jun)	Navigate in pairs a course of 6-8 posts out of 8-10 posts available around the park. Fake posts are placed between the corect ones.
36 (Jun)	Solo navigation using a map. Fake posts are placed around the park and the students leave at different intervals.
37 (Jun)	City Navigation

Note: The games and initiatives have been inspired from Rohnke (1984, 1989), Rohnke & Butler (1995), Panicucci (2002), Hammes (2007), Eliot & Pieper (nd). The orienteering activities have been inspired from Larkin & Grogger (1975), Csaba (2006).

Conclusions

Looking at the amount of research that shows the positive impact that this kind of activities have on the personal and social development of the students, we believe that implementing adventure education activities in the physical education lessons will raise the importance of this subject. We consider that we found several valid means of introducing adventure education in those lessons and the activities presented in this paper support the objectives set by the Ministry of Education. The activities can be done with little additional resources and could easily be adapted to any school. Furthermore, a study done on the effects of the program on middle school students has noted a significant development in dynamic balance and cardiovascular endurance, compared to the control group, and arm strength development similar to regular PE activities (Ganea & Grosu, nd).

If that is not enough, we can also confirm what Walsh & Aubry (2007) have said: these types of activities are fun and engaging, and the students enjoy taking part in them.

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