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EDITORIAL

Ethical and deontological issues in school and university sports
Etic şi deontologic în educaţia fizică şi sportul şcolar şi universitar

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Teaching and scientific activities specific to education and implicitly, physical education and sports activities must be based on ethical and deontological principles. Because the field of *physical education and sport* is through its assumed missions an interdisciplinary field, it involves major interferences with several adjacent areas: education sciences, medicine, psychology, sociology, etc. This is why both the teaching and the scientific research component of physical education must adopt some of the ethical and deontological principles of these interference areas.

It should not be overlooked that teaching in physical education is predominantly based on practical activities intended for the category of what is known as the school and university population, in order to achieve the main objective assumed, that of ensuring and maintaining an optimal health status. Physical education or *sport*, as physical education is defined in the *White Book of Sport* (***, 2007), is intended for the entire middle school population and partly, for the high school and university population. However, the fact that sport has become compulsory in the curricula of these categories requires the respect of some deontological rules. One of these rules, which is perhaps the most important one, is to take into consideration the *different biopsychomotor characteristics of the participants*, during the teaching process. This rule involves the a priori knowledge of these characteristics, which can only be obtained by the preliminary testing of the subjects and their classification into groups depending on their physical fitness and health level. Subsequently, the differentiated and individualized treatment and evaluation of the participating pupils and students will allow them to take pleasure in physical education and sports activities. We have written about some of these aspects in previous editorials. Now, we cite a published article referring to medical examination prior to the beginning of organized activity, as a deontological requirement for curricular physical education and sports activity (Bocu et al., 2002a). The authors propose the distribution of the participants (pupils-students) into 5 categories of physical exercise depending on their health status, and the consecutive adaptation of exercise and evaluation according to this health status, based on the proposals of the department, for different physical fitness and health levels (Bocu et al., 2002b). In line with the results of annual medical examinations conducted by school and university doctors, the profile of participants in physical education and sports activities can be established, so as to allow the application of differentiated and individualized methods specific to the profession, used as principles.

On the other hand, scientific research in the field of physical education adopts methods used by interference disciplines (medicine, education sciences, psychology, sociology). For example, an extension of the research area is the *study of physical exercise* based on the study of human or animal subjects. This is why the ethical and deontological code of physical education must use and respect the ethical rules specific to the fields related to the research performed. In any situation, the research must be based on a study protocol including at least the following aspects: *title; hypothesis; period and place of the research; subjects and groups; tests applied; statistical processing.*

According to the legislation in force (Law 206/2004) (Raicu, 2005) and to the provisions of the (internal) University Ethical and Deontological Code, as well as to international declarations and agreements (***, 2008), the research methodology and ethics have to be respected. Studies on human subjects will have to take into account as a priority the avoidance of any physical, mental or moral damage to the participants and will be initiated only after obtaining the informed consent of the participants. In the case of minor participants, the informed consent of the parent/legal tutor must be obtained. A research project, even in the case of research for graduation/master theses, must be approved in terms of research ethics, according to the case, by the scientific supervisor and the Ethics Commission of the faculty/university. The basic idea is that any research activity performed on human subjects or any experiment carried out on animals requires the approval

of the university Ethics Commission or of authorized committees, while respecting the special ethical norms of research activity (1, 2).

The requirements for a research project are: to be developed by experienced researchers, to have an adequate infrastructure, to be based on the informed consent of the subjects, to be approved by an ethics board experienced in the rights and needs of children (Butnariu et al., 2009).

The use of the research results also falls under the incidence of professional ethical and deontological norms. Results can be used in three ways: presentation in scientific meetings, publication in specialized journals, and application in practice through the research performed. In all these three forms, the approval of the Ethics Commission, obtained before the initiation of the research, is assuring.

In 2004, the Law on good practice in scientific research, technological development and innovation was elaborated (Raicu, 2004; Raicu, 2005), which was changed and completed by Law no. 398/2006 (Pisoschi & Ardelean, 2007), inspired by international legislation. According to this law, Romania as a full right member of the European Union has the obligation to strictly respect the laws and rules of the European Union regarding ethical requirements in science (Butnariu et al., 2009).

* * *

Cele două activităţi specifice educaţiei, didactică şi ştiinţifică, implicit activităţile de educaţie fizică şi sport trebuie să se bazeze pe principiile eticii şi deontologiei. Deoarece domeniul *educaţie fizică şi sport*, prin misiunile pe care şi le-a asumat, este un domeniu interdisciplinar, acesta are interferenţe majore cu câteva domenii limitrofe: ştiinţele educaţiei, medicina, psihologia, sociologia şi altele. Din aceste motive, atât componenta didactică, cât şi de cercetare ştiinţifică a educaţiei fizice este necesar să preia din principiile etice şi deontologice ale acestor domenii de interferenţă.

Nu trebuie uitat faptul că activitatea didactică a educaţiei fizice se bazează preponderent pe activităţi practice, care se adresează categoriei numită populaţie şcolară şi universitară, în scopul atingerii principalului obiectiv asumat, cel al promovării şi menţinerii unei stări de sănătate optimă. Educaţia fizică sau *sportul*, cum este definită aceasta în *Cartea albă a sportului* (***, 2007), se adresează întregii populaţii de vârstă gimnazială şi parţial celei liceale şi universitare. Dar, faptul că sportul devine obligatoriu în curricula acestor categorii, impune respectarea unor reguli deontologice. Una dintre aceste reguli şi poate cea mai importantă este respectarea *configuraţiei biopsihomotrice diferenţiate a participanţilor*, pe parcursul procesului didactic. Această regulă implică cunoaşterea a priori a acestei configuraţii, fapt care se poate obţine numai prin testarea prealabilă a subiecţilor şi repartizarea lor pe grupe graduale de nivel al condiţiei fizice şi stării de sănătate. În continuare, tratarea diferenţiată şi individualizată precum şi evaluarea diferenţiată, vor face ca participanţii elevi şi studenţi să participe cu plăcere la activităţile de educaţie fizică şi sport. În editorialele noastre precedente am mai scris despre unele din aceste aspecte. De această dată citãm un articol publicat, referitor la examenul medical prealabil începerii activităţii organizate, ca o necesitate deontologică în activitatea curriculară de educaţie fizică şi sport (Bocu et al., 2002a). Autorii propun repartizarea participanţilor (elevi-studenţi) pe 5 categorii de efort fizic combinat cu starea de sănătate constatată, iar ca urmare adaptarea efortului şi evaluării conform acestor stări constatate, potrivit unor oferte ale catedrei, elaborate pentru diferite niveluri ale condiţiei fizice şi stării de sănătate (Bocu et al., 2002b). Cuplate cu unele rezultatele extrase din examenele de bilanţ anual efectuate de medicii şcolari şi universitari, pot fi alcătuite profilele participanţilor la activităţile de educaţie fizică şi sport, în aşa fel încât să poată fi aplicate metodele diferenţiate şi individualizate specifice profesiei, ridicate la rang de principii.

Cercetarea ştiinţifică în domeniul educaţiei fizice, în schimb, împrumută metode din disciplinele de interferenţă (medicină, ştiinţele educaţiei, psihologie, sociologie). Spre exemplu, o extensie a ariei de cercetare este *studiul efortului fizic* efectuat prin cercetări pe subiecţi umani sau pe animale. De aceea, codul de etică şi deontologie al domeniului educaţie fizică trebuie să folosească şi să respecte regulile de etică specifice domeniilor în care se încadrează cercetarea. În orice situaţie cercetarea va trebui să se bazeze pe un protocol, care va trebui să cuprindă cel puţin următoarele repere: *titlul cercetării; ipoteza; perioada şi locul desfăşurării cercetării; subiecţii şi loturile; testele aplicate; procesarea statistică.*

Conform legii în vigoare 206/2004 (Raicu, 2005) şi a prevederilor din Codul de etică şi deontologie universitară (internă) precum şi a declaraţiilor şi acordurilor internaţionale (***, 2008) trebuie respectată metodologia şi etica în cercetare. Cercetările pe subiecţi umani vor trebui să aibă în vedere cu prioritate evitarea oricărei prejudicieri fizice, psihice sau morale a participanţilor şi se vor desfăşura numai după obţinerea consimţământului informat al participanţilor. În cazul participanţilor minori, este necesară obţinerea consimţământului informat al părintelui/tutorelui legal. Proiectul de cercetare, chiar şi în cazul cercetărilor pentru lucrarea de licenţă/disertaţie, trebuie avizat din punctul de vedere al eticii de cercetare, după caz, de îndrumătorul ştiinţific şi de Comisia de etică din facultate/universitate. Ideea care se desprinde este aceea că pentru orice activitate de cercetare efectuată pe subiecţi umani sau prin experimente desfăşurate pe animale trebuie să se obţină avizul prealabil al Comisiei de etică al universităţii sau a comitetelor abilitate, cu respectarea normelor speciale de etică în activitatea de cercetare (1, 2).

Un proiect de cercetare trebuie să fie realizat de cercetători cu experienţă, să beneficieze de infrastructură adecvată, să se bazeze pe consimţământul informat/avizul subiecţilor, să fie aprobat de către un comitet de etică cu experienţă în drepturile şi nevoile copiilor (Butnariu et al., 2009).

Sub incidenţa Normelor de etică şi deontologie profesională intră şi formele de valorificare ale rezultatelor cercetării. Valorificarea se poate face în trei feluri: comunicarea în cadrul unor manifestări ştiinţifice, publicarea în reviste de specialitate şi aplicarea în practică

a rezultatelor obţinute prin cercetarea efectuată. În toate din aceste trei forme de valorificare existenţa avizului Comisiei de etică, obţinut la începutul cercetării, este asigurator.

În anul 2004 s-a elaborat Legea privind buna conduită în cercetarea ştiinţifică, dezvoltarea tehnologică şi inovare (Raicu, 2004; Raicu, 2005), modificată şi completată prin legea nr.398/2006 (Pisoschi & Ardelean, 2007), legi inspirate din legislaţia internaţională. Conform acestor legi, România, ca ţară membră cu drepturi depline a Uniunii Europene, are obligaţia de a respecta cu stricteţe legislaţia şi regulile Uniunii Europene referitoare la reglementările etice în ştiinţă (Butnariu et al., 2009).

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ORIGINAL STUDIES
ARTICOLE ORIGINALE

Sex-related differences in isokinetic muscular contraction
Diferenţe ale contracţiei musculare izocinetice între cele două sexe

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Abstract

Background. The ability of muscle to develop torque depends on many factors, such as muscular mass, fibre type, activation characteristics, factors that are different enough in males and females.

Aims. To analyse the differences between the two genders concerning isokinetic muscular contraction in knee extensor and flexor muscles.

Methods. 22 healthy volunteers (10 males and 12 females) were included in this study. After a 5-minute warm-up period, subjects had to perform an isokinetic muscle testing protocol on a Gymnex Iso 2 isokinetic dynamometer, consisting of 30 maximal reciprocal isokinetic contractions (knee flexion – extension) on the dominant lower limb, at 180º/sec velocity. Analysed parameters (for extension and flexion) were: peak torque, work, power, muscle endurance index. Parameters were analysed in absolute values and relative to body mass.

Results. Significantly higher absolute values ($p<0.05$) were registered in men than in women for peak torque, work and power, for both extension and flexion. When parameters were calculated relative to body mass, statistical significance was no longer met ($p>0.05$). On the other hand, significantly faster fatigue with lower values of the muscular endurance index ($p<0.05$) were registered in men than in women.

Conclusions. Muscle contraction ability and muscle fatigue are gender-specific, which could be a possible explanation for the different predisposition for certain injuries in males and females.

Keywords: gender, muscular contraction, isokinetic, knee.

Rezumat

Premize. Capacitatea muşchiului de a produce forţă depinde de mai mulţi factori, precum masa musculară, tipul de fibre, caracteristicile de activare, factori care diferă destul de mult între femei şi bărbaţi.

Obiective. Analizarea diferenţelor dintre cele două sexe, din punct de vedere al contracţiei musculare izokinetice la nivelul extensorilor şi flexorilor genunchiului.

Metode. În studiu au fost incluşi 22 de voluntari sănătoşi (10 bărbaţi şi 12 femei). După o perioadă de încălzire de 5 minute, subiecţii au fost supuşi unui protocol de testare musculară izokinetică, utilizând un dinamometru izokinetic Gymnex Iso 2. Protocolul a constat din 30 de contracţii izokinetice maximale reciproce (flexii – extensii de genunchi) la nivelul membrului inferior dominant, la o viteză unghiulară de 180º/sec. Parametrii analizaţi (pentru extensie şi flexie) au fost: torque-ul maxim, lucrul mecanic, puterea, indicele de rezistenţă musculară. Parametrii au fost analizaţi în valoare absolută şi raportaţi la greutatea corporală.

Rezultate. La bărbaţi s-au înregistrat valori absolute semnificativ mai mari ($p<0,05$) decât la femei, pentru torque-ul maxim, lucru mecanic, putere, atât pentru extensie, cât şi pentru flexie. Când parametrii au fost raportaţi la masa corporală nu s-au mai obţinut semnificaţii statistice ($p>0,05$). Pe de altă parte, la bărbaţi oboseala musculară s-a instalat semnificativ mai rapid, cu valori mai scăzute ale indicelui de rezistenţă musculară ($p<0,05$) decât la femei.

Concluzii. Capacitatea de contracţie musculară şi fatigabilitatea musculară sunt sex-specifice. Aceasta ar putea reprezenta o explicaţie pentru predispoziţia diferită către anumite tipuri de leziuni la bărbaţi şi la femei.

Cuvinte cheie: sex, contracţie musculară, isokinetic, genunchi.

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Introduction

Muscle force-generating ability depends on many factors, such as muscle mass, muscle fibre type, and muscle activation characteristics (Pincivero et al., 2003), which are quite different between men and women.

Thus, a recent trial found that thigh cross-sectional area decreased with age mainly because of a decrease in muscle cross-sectional area in men and in fat cross-sectional area in women. Furthermore, the rate of decrease in muscle cross-sectional area was 1.5-fold higher in men than in women. At the same time, muscle cross-sectional area decreased with age mainly because of a decrease in quadriceps cross-sectional area, especially in women. Nevertheless, there was no difference in the decrease of muscle quality with age between the two genders (Kasai et al., 2014).

In another trial, sex-related differences were found in mRNA and protein content for 66 genes involved in metabolism, mitochondrial function, transport, protein biosynthesis, cell proliferation, signal transduction pathways, transcription, translation and determination of muscle fibre type. Thus, mRNA for acyl-coenzyme A acyltransferase 2, trifunctional protein beta, catalase, lipoprotein lipase, and uncoupling protein-2 was higher in women, as well as myosin heavy chain I and peroxisome proliferator-activated receptor delta. The authors suggested that the higher area percentage of type I skeletal muscle fibres in women (Maher et al., 2009) and the decreased fast-twitch fibre size in men (Yu et al., 2007) could be related to these differences.

Sex-related differences have also been described in muscle activation pattern. Thus, when a discrete functional task (carrying a grocery bag) was analysed, it was found that the number of bursts in women was 85% less compared with men, but the burst duration and burst area were approximately three times more extensive in women compared with men (Harwood et al., 2008).

At the same time, the maximal rate of muscle relaxation, which was correlated with muscle fatigability, was found to be lower in women, indicating that their muscles were slower than those of men. The authors proposed the difference in fibre type composition as a possible factor leading to the sex-related difference in skeletal muscle fatigue resistance, which could not be explained by differences in motivation, muscle size, oxidative capacity or blood flow between sexes (Wüst et al., 2008).

In this context, we tried to prove that all these sex-related differences in muscle structural and functional properties also influence muscle performance, leading to differences between men and women.

Hypothesis

The purpose of the study was to analyse the differences between the two genders concerning isokinetic muscular contraction parameters (peak torque, work, power, muscle fatigue) in knee extensor and flexor muscles. We assumed that men would develop more strength and would produce higher levels of peak torque, power and work, but would also present earlier and greater muscle fatigue than women.

Materials and methods

We mention that the research protocol was in conformity with the Helsinki Declaration, Amsterdam Protocol and Directive 86/609/EEC, and the approval of the Ethics Committee of the University of Medicine and Pharmacy Cluj-Napoca regarding research on human subjects was obtained. The research procedures were explained to all the study participants and an informed consent was also obtained from all patients prior to the study.

Research protocol

The research was structured as an observational cross-sectional study.

a) *Period and place of the research*

The study was conducted between May and July 2008, in the Rehabilitation Hospital Cluj-Napoca.

b) *Subjects*

The study included 22 healthy volunteers (10 men and 12 women). They were recruited from the students and physical therapists working at the Rehabilitation Hospital Cluj-Napoca. Inclusion criteria: age between 18 and 40 years. Exclusion criteria: BMI greater than 35kg/m^2, history of musculoskeletal impairments, high blood pressure, chronic diseases.

c) *Tests applied*

The subjects were assessed once. Strength testing of knee extensor and flexor muscles was performed isokinetically, using a Gimnex Iso 2 dynamometer. The evaluation protocol included a 5-minute warm-up session on the ergometric bicycle. Afterwards, there was a short period of familiarization with the dynamometer, consisting of one set of 5 submaximal repetitions of knee flexions and extensions at a velocity of 240°/sec. After a rest period of 2 minutes, muscle performance was assessed by a set of 30 maximal reciprocal concentric isokinetic contractions (knee flexion – extension) on the dominant lower limb, at a velocity of 180°/sec. A comparison was made between the performance of men and women. For both extensor and flexor muscles, the following parameters were analysed: peak torque, work, power, muscular endurance index (calculated as the percentage ratio between the average work of the last three repetitions and the average work of the first three repetitions). These parameters were analysed in absolute values, but also relative to body mass.

d) *Statistical processing*

Quantitative variables were expressed as mean ± standard deviation (SD). Once the normal distribution of data was confirmed by the Kolmogorov-Smirnov test, the statistical analysis of differences between the two groups (men and women) was carried out using the Student t test for independent samples (variance was tested previously). The statistical significance threshold was at $p \leq 0.05$. The software used was Microsoft Excel 8.0 for Windows and MedCalc 12 (trial version).

Results

There was no significant difference in age between men and women, but the body mass index (BMI), body weight and height were significantly higher in the group of men (Table I).

Table I
Patient demographic characteristics.

Variable	Women (mean±SD)	Men (mean±SD)	Statistical significance (p)
Number	12	10	-
Age (years)	27.0±6.9	29.6±4.5	0.32
BMI (kg/m^2)	21.3±2.8	24.9±2.9	<0.01
Body weight (kg)	57.6±8.1	79.9±11.5	<0.01
Height (m)	164.4±6.9	178.9±5.9	<0.01

Higher absolute peak torque values were recorded in men than in women for both extensor and flexor muscles (Figure 1).

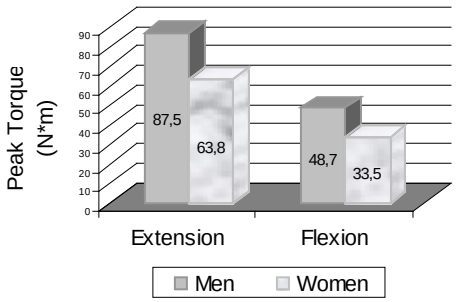

Fig. 1 – Peak torque for extensors and flexors in the two genders.

Also, a better performance was found in men when absolute values for work (Figure 2) and power (Figure 3) were taken into account, both for extensors and flexors.

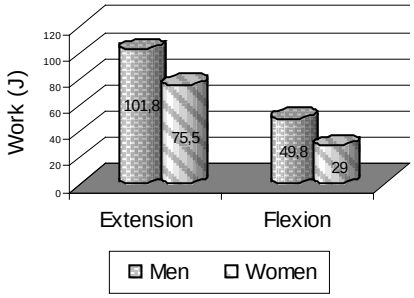

Fig. 2 – Work for extensors and flexors in the two genders.

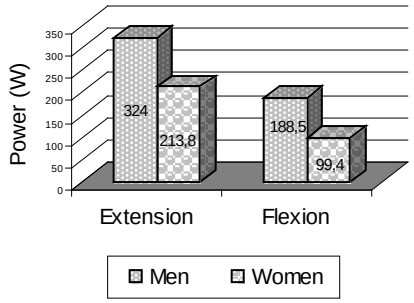

Fig. 3 – Power for extensors and flexors in the two genders.

Higher values in men compared to women were also found when these parameters were calculated relative to body mass, but statistical significance was no longer met for extensors (Table II), or for flexors (Table III).

Table II
Peak torque, power and work for extensors, in absolute values, relative to body mass.

Variable	Men (mean±SD)	Women (mean±SD)	Student t-test
PT Ext (Nm)	87.5±23.7	63.8±14.9	P=0.009
PT Ext / BM (Nm/kg)	1.10±0.28	1.10±0.17	P=0.98
Pw Ext (W)	324.0±96.1	213.8±32.6	P=0.001
Pw Ext / BM (W/kg)	4.0±1.1	3.7±0.6	P=0.39
W Ext (J)	101.8±26.1	75.5±15.0	P=0.007
W Ext / BM (J/kg)	1.28±0.30	1.30±0.14	P=0.79

Table III
Peak torque, power and work for flexors, in absolute values, relative to body mass.

Variable	Men (mean±SD)	Women (mean±SD)	Student t-test
PT Flx (Nm)	48.7±12.3	33.5±8.1	P=0.002
PT Flx / BM (Nm/kg)	0.61±0.14	0.59±0.16	P=0.78
Pw Flx (W)	188.5±69.6	99.4±49.0	P=0.002
Pw Flx / BM (W/kg)	2.3±0.8	1.7±0.9	P=0.16
W Flx (J)	49.8±15.3	29.0±12.1	P=0.002
W Flx / BM (J/kg)	0.61±0.16	0.51±0.22	P=0.23

On the other hand, significantly faster fatigue with lower values of the muscular endurance index were recorded in men than in women (Figure 4).

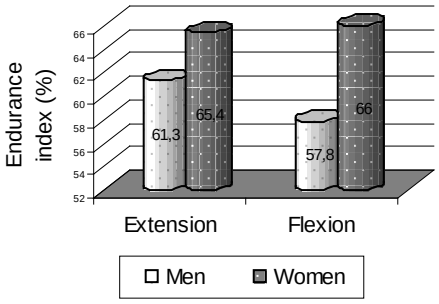

Fig. 4 – Endurance index for extensors and flexors in the two genders.

Muscle strength was always higher in extensors than in flexors.

Discussions

In the present study, muscular performance was compared between men and women, using the isokinetic method of evaluation. We found that men developed significantly higher rates of peak torque, work and power than women, for both extensor and flexor muscles, when absolute values were taken into account. But when these absolute values were normalized to body mass, statistical significance was no longer met in any of the parameters.

At the same time, we found that muscle fatigue appeared earlier in men than in women, corresponding to a significantly lower value of the muscular endurance index in men.

In a similar study investigating gender-specific knee extensor torque, knee flexor torque and muscle fatigue responses during maximal effort contractions, Pincivero observed that males generated significantly higher levels

of knee extensor and flexor torque in absolute values, similarly to our study. But when absolute values of torque were normalized to body mass, even if differences between genders were less important, Pincivero found that they were still statistically significant (Pincivero et al., 2003), which was later also reported by Musselman (Musselman & Brouwer, 2005), contrary to our findings. On the other hand, Musselman noticed that males experienced a significantly higher rate of quadriceps femoris and hamstring muscle fatigue than females, corresponding to our observations and those of Pincivero, where healthy young men were shown to exhibit a faster rate of knee extensor torque fatigue than women, which was highly correlated with peak voluntary work (Pincivero et al., 2003). Musselman also found that the percent decreases in peak torque, work and power were not significantly different between the quadriceps and hamstrings. The conclusion of the study was that muscle force-generating ability and fatigue followed a gender-specific pattern: males generated greater knee extensor and flexor peak torque, work and power than females, but the result was a higher rate of muscle fatigue. They suggested that this gender-specific muscle fatigue pattern could be implicated in gender-related injury patterns. Numerous factors, such as muscle fibre type, oxidative potential, muscle activation, and specific tension, have been mentioned as playing a significant role in the gender-specific response of muscle fatigue. Similarly to our study, Deschenes found not only that peak torque was significantly higher in men than in women during isokinetic testing, but also that total work and power followed the same pattern (Deschenes et al., 2012).

The discordance between our study and Pincivero's study concerning the significance of sex-related differences in relative peak torque values (normalized to body mass) could be explained by differences in the characteristics of the populations included in the two studies (such as body weight, age). In this sense, Maffiuletti found that obese subjects displayed higher absolute, but lower relative (normalized to body mass) muscle torque values than lean subjects. Moreover, voluntary torque loss, corresponding to muscle fatigue, was significantly higher in obese than in lean subjects. These muscle function impairments (voluntary fatigue and relative strength) could contribute to the reduced functional capacity of obese subjects during daily living activities (Maffiuletti et al., 2007).

Muscle fatigue, classically defined as an exercise-induced decline in maximal voluntary muscle force or power (Enoka et al., 2008), was found to be less important in women than in men, mainly in young people, but the magnitude of sex differences in the performance of a fatiguing contraction is lessened or disappears among older adults (Hunter, 2009). In the same review, Hunter also demonstrated that the mechanisms involved in this sex difference are task specific. Furthermore, Avin showed that sex differences in fatigue resistance are muscle group dependent. In his study, women were more resistant to fatigue than men at the elbow, but not at the ankle (Avin et al., 2010). The authors of another systematic review and meta-analysis also noticed that older individuals tended to fatigue less than young individuals, regardless of sex, but the final conclusion was that additional large sample size studies were needed in order to clarify the age-sex interaction in the development of muscle fatigue (Christie et al., 2011). At the same time, they emphasized that muscle power was highly predictive for future morbidity and strongly related to physical function and, therefore, further research of muscle fatigue should use power as a fatigue index.

Recent studies have tried to elucidate the physiological mechanisms underlying these sex differences. In this sense, Ayala noticed that the hamstrings reaction time profile was different in the two genders: women had longer total reaction time, pre-motor time and motor time values than men, with a possible role in the greater anterior cruciate ligament injury risk in women (Ayala et al., 2013). Clark found that men synergistically recruit the rectus femoris compartment of the quadriceps muscle to a lesser extent than women in association with muscle fatigue and that women achieve an overall greater relative activation of the quadriceps at task failure than men (Clark et al., 2005). In her very recent and complex review, Hunter included as possible physiological mechanisms responsible for sex-based differences in fatigability the activation of the motor neuron pool from cortical and subcortical regions, synaptic inputs to the motor neuron pool via activation of metabolically sensitive small afferent fibres in the muscle, muscle perfusion and skeletal muscle metabolism and fibre type properties. Task variables leading to sex differences in fatigability, such as the type, intensity and speed of contraction, the muscle group assessed and environmental conditions, were also listed. Nevertheless, the author concluded that further research is very much needed in order to understand the sex differences in neuromuscular function and fatigability (Hunter, 2014).

Conclusions

Muscle contraction ability and muscle fatigue are gender-specific. This could be a possible explanation for the different predisposition for certain injuries in males and females.

Conflicts of interest

There are no conflicts of interest.

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Prevalence and co-occurrence of several unhealthy alimentary habits among Romanian young people

Prevalenţa şi prezenţa simultană a diferite obiceiuri alimentare nesănătoase în rândul tinerilor din România

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Abstract

Background. Healthy nutrition is an important component of health promotion and disease prevention. The food habits of young people are important not only in ensuring an adequate diet to support growth and development, but also in developing lifelong patterns for maintaining health.

Aims. This study assesses the prevalence and co-occurrence of several unhealthy alimentary habits among Romanian young people, giving special attention to age and gender differences.

Methods. A cross-sectional study was performed among junior high schools, senior high schools and universities from 2 counties of Romania. Anonymous questionnaires which investigated skipping breakfast as well as less than daily consumption of fruits, vegetables and dairy products were used.

Results. The sample consisted of 1598 students aged between 11-25 years. The results show that many Romanian young people engage themselves in unhealthy alimentary behaviors and that a co-occurrence of several unhealthy behaviors is also observed. A percentage of around 70% of junior high school students, 80% of senior high school students and 90% of university subjects declared more than one unhealthy alimentary behavior.

Conclusions. The results underline that comprehensive programs, which address healthy nutrition, are required for Romanian young people.

Key words: nutrition, young people, health promotion.

Rezumat

Premize. Alimentaţia sănătoasă este o componentă importantă a promovării sănătăţii şi prevenirii bolilor. Obiceiurile alimentare ale tinerilor sunt importante nu doar pentru a asigura creşterea şi dezvoltarea, dar contribuie şi la stabilirea unor obiceiuri care vor continua ulterior în viaţă, influenţând starea de sănătate.

Obiective. Acest studiu evaluează prevalenţa şi prezenţa simultană a diferite obiceiuri alimentare cu risc pentru sănătate în rândul tinerilor din România, acordând o atenţie specială diferenţelor care pot să existe între diferite categorii de vârstă, respectiv între fete şi băieţi.

Metode. A fost realizat un studiu transversal în rândul elevilor de şcoală generală, liceu şi universitate din 2 judeţe din Transilvania. Au fost folosite chestionare anonime care au investigat consumul micului dejun, precum şi consumul de legume, fructe şi produse lactate, mai rar decât zilnic.

Rezultate. Eşantionul studiului a fost alcătuit din 1598 subiecţi cu vârsta cuprinsă între 11-25 ani. Rezultatele arată faptul că mulţi tineri români adoptă obiceiuri alimentare cu risc pentru sănătate, fiind observată existenţa concomitentă a mai multor obiceiuri nesănătoase. Un procent de aproximativ 70% dintre elevii de şcoală generală, 80% dintre elevii de liceu şi 90% dintre studenţi au declarat mai mult de un obicei alimentar nesănătos.

Concluzii. Rezultatele studiului subliniază faptul că este nevoie de programe ample care să promoveze o alimentaţie sănătoasă în rândul tinerilor din România.

Cuvinte cheie: nutriţie, tineri, promovarea sănătăţii.

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Introduction

Healthy nutrition is an important component of health promotion and disease prevention. In childhood and adolescence, the health impact of nutrition is vital (***, 2002; ***, 2010). The food habits of adolescents are important not only in ensuring an adequate diet to support growth and development, but also in developing lifelong patterns for maintaining health. Eating habits are frequently established in childhood and adolescence and in addition to short-term consequences, they also have many long-term consequences, due to the fact that bad habits established during this period will generally continue during adulthood (Currie, 2008; Lotrean et al., 2005; Upton et al., 2012; Hamrani et al., 2014; Baharudin et al., 2012). Moreover, a co-occurrence of several unhealthy alimentary habits could be present, which increases the health and developmental risk (Acar et al., 2011).

The prevalence of unhealthy alimentary habits differs per country, as will the determinants of such behaviors (Mette et al., 2006; Fahlman et al., 2010; Currie, 2008). In order to develop efficient programs for encouraging healthy eating, it is very important to first identify the alimentary habits that should be corrected or improved (Granner & Evans, 2012). Nevertheless, in Romania there is little information with regard to the eating habits of Romanian young people. The only study based on a national representative study, namely Health Behaviour in School Aged Children, assessed several eating patterns of Romanian children aged 11, 13 and 15 years, besides several other health-risk behaviors. It showed that eating breakfast every school day varied from 41% for 15 year-old children to 51% among 11 year-old subjects. Use of fruits every day was around 46% among 11 year-old children and dropped significantly to 35% among 15 year-old children (Currie, 2008).

Hypothesis

This article will study the alimentary habits of Romanian youths, covering a broad age range, starting with junior high school students and continuing with senior high school students and university students. It has three main objectives. The first one is to assess the prevalence of several unhealthy alimentary behaviors among Romanian young people; the selected behaviors are some of the most relevant and common health-risk alimentary behaviors among youngsters: skipping breakfast, use of fruits and vegetables as well as use of dairy products less than daily. The second objective is to investigate the co-occurrence of these health-risk behaviors. Finally, the study will focus on identifying age and gender differences with regard to the prevalence of unhealthy alimentary habits and their interrelationship.

Material and methods

Research protocol

a) *Period and place of the research*

A cross-sectional study was conducted in school settings from two counties situated in the North-West of Romania, namely Cluj and Hunedoara counties. The study was performed in the period November 2003 - February 2004. The study was approved by the Review Committee and the directorates of the participating schools; in Romania, school principals are entitled to decide whether or not their students may participate in health related surveys and educational programs. All participants read an introductory letter, which assured them that the study procedures were designed to protect student anonymity and allow for voluntary participation.

The study was conducted in each county capital (meaning Deva for Hunedoara county, Cluj-Napoca for Cluj county) and in a village from each county (Criscior in Hunedoara county, Cuzdrioara in Cluj county, respectively). In Romania, the school system comprises four types of education levels: elementary schools (7-11 year-old students), junior high schools or secondary schools (11-15 year-old students), senior high schools (15-19 year-old students) and universities (students aged 19 years or older).

In the urban areas, two junior high schools were randomly chosen, one located downtown and one in an adjacent neighborhood, so that subjects would have a different cultural and socio-economic level, and two senior high schools - one with a higher training level of the students (high grades at the high school entrance examination and remarkable results in school competitions) and one with a lower training level of the students were selected. In each of the two villages, there was only one junior high school and one senior high school, which were included in study. From each junior and senior high school, 1-2 classes were randomly chosen for each study year, and all pupils that were present in these selected classes on the day of the survey were included in the study. The consent for the participation of the students in the study was obtained from school administration – the standard procedure in Romania at that time. The principals of the selected schools were contacted personally by one of the members of the research team and were approached regarding the participation in a survey investigating health-related behaviors of young people. All principals agreed to participate.

In Cluj-Napoca, the study was also carried out among university students randomly chosen from 8 dorms belonging to the 4 main universities of the city; 40 girls, respectively 40 boys living in the selected dorms were randomly chosen from each university. In Deva, the study included 40 girls and 40 boys from the main town university, who were randomly chosen and asked to participate in the study during their university activity, because there were no dorms belonging to the university (Lotrean et al., 2010).

Subjects and groups

The study sample consisted of 1598 subjects: 630 junior high school students aged 11-15 years (324 boys and 306 girls, 498 from the urban area and 132 from the rural area), 568 senior high school students aged 15-19 years (281 boys and 287 girls, 325 from the urban area and 243 from the rural area), and 400 university students, aged 19 to 25 years (200 boys and 200 girls).

b) *Tests applied*

The study used anonymous questionnaires, which were filled in by the students. All study subjects were asked to fill in an anonymous questionnaire, which took approximately 50 minutes.

Among junior and senior high school students, the questionnaire was administered and collected in the classroom by members of the research team. Teachers were present in the classroom during data collection, but they stayed in the front of the class and did not take part in the questionnaire collection. No refusals were recorded; non-responses were exclusively due to absence during the day of assessment.

University students in Cluj-Napoca completed the questionnaire in the dorm and university students in Deva completed in at home; the researchers collected them afterwards. The refusal rate was low (2.7%) and the students who refused to participate were replaced with students chosen from the same university (Lotrean et al., 2010).

The questionnaire was developed for this research study based on literature data and included items related to demographics, as well as a broad range of healthy and unhealthy behaviors, the presence or absence of which might have immediate or long-term effects on the health status of adolescents and young adults (Lotrean et al., 2010).

For this analysis, we used 4 marker questions for eating behaviors. The first question investigated the frequency of eating breakfast and the variable created was skipping breakfast (never versus at least once a week) (Hoertel et al., 2014). Other investigated issues were consumption of fruits and vegetables (except potatoes) and the variables created were not using fruits and vegetables, respectively, every day (0-no, 1-yes), since recommendations are to use these products every day (Christian et al., 2013; Grutzmacher & Gross, 2011; Upton et al., 2012). The last question investigated the consumption of dairy products and again, the created variable was not consuming dairy products daily (0-no, 1-yes), while recommendations are to eat them daily (***, 2002; ***, 2010).

c) *Statistical processing*

First, the prevalence for each of the 4 unhealthy behaviors was calculated and chi^2 tests were used to assess age and gender differences.

Secondly, the co-occurrence of several unhealthy alimentary habits was calculated. The percentage of students who engaged in multiple risk behaviors was calculated by adding the number of the following risk alimentary behaviors reported by each student: (1) skipping breakfast (2) not eating vegetables every day (3) not eating fruits every day (4) not eating dairy products every day. Chi^2 tests were used to compare the students from the three age groups, as well as the girls and boys from each age group with respect to the prevalence of the co-occurrence of the studied alimentary habits.

Data analysis was performed with the SPSS-12 statistics program. Significant results were reported at $p<0.05$.

Results

Prevalence of unhealthy alimentary habits

The results show that almost 60% of the subjects did not eat breakfast every day; the prevalence of this unhealthy habit increased statistically significantly with age (Table I), from 45% among junior high school students to 75% among university students. With respect to gender differences, Table 1 also shows that skipping breakfast was more frequent among girls than among boys for junior and senior high school students, while for university students, it was the other way around.

About 80% of the subjects did not eat vegetables every day, while two thirds of the students did not eat fruits on a daily basis. The prevalence of both behaviors increased statistically significantly with age. The frequency of not eating vegetables every day was similar for boys and girls in all three age groups. On the other hand, among both senior high school students and university students, the percentage of girls who did not eat fruits on a daily basis was lower compared to the percentage of boys from the same age group.

The percentage of the subjects who did not eat dairy products every day was lower than in the case of inadequate consumption of fruits and vegetables; only 45% of the students did not eat dairy products daily and no age differences were identified. No gender differences

Table I

Prevalence of unhealthy alimentary behaviors.

Alimentary habits	Total %	Junior high school %	Senior high school %	University %
Total				
Skipping breakfast	57.9	45.1[a,b]	61.8[c]	72.3
Inappropriate consumption of vegetables	81.2	73.9[a,b]	81.8[c]	90.5
Inappropriate consumption of fruits	61.2	49.2[a,b]	60.5[c]	80.2
Inappropriate consumption of dairy products	43.8	44.1	45.1	42.3
Girls				
Skipping breakfast	60.7	51.5[a,b,d]	65.9[d]	67.5[d]
Inappropriate consumption of vegetables	79.9	71.6[a,b]	81[c]	91
Inappropriate consumption of fruits	56.2	46.4[a,b]	55.3[c,d]	71.9[d]
Inappropriate consumption of dairy products	44.8	45[b]	51.6[c,d]	34.5[d]
Boys				
Skipping breakfast	54.9	39.2[a,b]	57.3[c]	77.2
Inappropriate consumption of vegetables	82.6	75.9[b]	82.3[c]	92
Inappropriate consumption of fruits	66.2	51.2[a,b]	65.4[c]	88.4
Inappropriate consumption of dairy products	42.7	42.9	37.9[c]	48

a) statistically significant differences using the chi^2 test ($p<0.05$) between junior and senior high school students; b) statistically significant differences using the chi^2 test ($p<0.05$) between junior high school students and university students; c) statistically significant differences using the chi^2 test ($p<0.05$) between senior high school students and university students; d) statistically significant differences using the chi^2 test ($p<0.05$) between girls and boys from the same age group

were observed among junior high school students, but among senior high school students the inadequate use of dairy products was more frequent in boys, while among university students it was the other way around.

Co-occurrence of unhealthy alimentary habits

Table II shows that less than 5% of the subjects were not engaged in unhealthy alimentary habits, with statistically significant differences between junior high school students, senior high school students and university students. The prevalence of more than one unhealthy alimentary habit was around 70% among junior high school students, 80% among senior high school students and 90% among university subjects. One out of five study subjects was engaged in all four unhealthy eating behaviors, with an increasing tendency between the three age groups. Actually, among junior and senior high school students, the co-occurrence of two unhealthy alimentary habits had the highest prevalence, while for university students, the co-occurrence of three risky eating habits was predominant.

With respect to gender differences, there were no differences regarding the absence of unhealthy alimentary habits or the presence of only one risky eating habit, except the fact that among university students, more girls than boys reported only one risky behavior. The main gender difference was the fact that the co-occurrence of all four alimentary habits was more frequent among girls than among boys for the first two age groups, while for university students, an opposite situation was encountered.

Table II

Co-occurrence of unhealthy alimentary behaviors.

Number of unhealthy alimentary behaviors	Total %	Junior high school %	Senior high school %	University %
Total				
0	4.7	8.8[a,b]	3.3[c]	0.5
1	17.3	22.7.[b]	18.0[c]	8.6
2	29.4	33.0[b]	30.9[c]	22.6
3	29.4	23.1[b]	27.1[c]	41.6
4	19.2	12.4[a,b]	20.7[c]	26.7
Girls				
0	4.6	8.8[a,b]	3.2[c]	0.5
1	18.9	24.8[b]	18.1[c]	11.6[d]
2	30.2	29.2	30.7	31.1[d]
3	25.4	19.7[b]	23.2 [c,d]	36.8[d]
4	20.8	17.5[a,d]	24.8[d]	20.0[d]
Boys				
0	4.7	8.8[a,b]	3.5[c]	0.5
1	15.7	20.6[b]	17.8[c]	5.7
2	28.7	36.8[b]	31.0[c]	14.1
3	33.4	26.5[b]	31.0[c]	46.4
4	17.5	7.3[a,b]	16.7[c]	33.3

a) statistically significant differences using the chi^2 test ($p<0.05$) between junior and senior high school students; b) statistically significant differences using the chi^2 test ($p<0.05$) between junior high school students and university students; c) statistically significant differences using the chi^2 test ($p<0.05$) between senior high school students and university students; d) statistically significant differences using the chi^2 test ($p<0.05$) between girls and boys from the same age group.

Discussions

This study presents data on health-risk alimentary behaviors among Romanian young people. This study has three main strengths. First, the sample of the study comprises junior high school students, senior high school students, as well as university students, thus allowing a broad overview and comparison of different adolescent groups. Secondly, the study covers several alimentary habits. Thirdly, to the best of our knowledge, this is the first Romanian study assessing the accumulation of health-risk alimentary behaviors among Romanian young people. What are the main findings?

First, all the four unhealthy alimentary habits had quite a high prevalence in the study sample. The inadequate use of vegetables and fruits had the highest prevalence, which could be related to an inadequate consumption of fibers, vitamins, minerals and antioxidants, leading to an increased risk for long-term health problems such as cancer and cardiovascular diseases (Mette et al., 2006; Caton et al., 2012; Granner et al., 2012).

Skipping breakfast was also found among many subjects. This influences the quality and quantity of a person's daily dietary intake, as well as cognition and learning, and consequently affects the adolescents' capacity to take advantage of learning opportunities provided by schools and families (Currie et al., 2008; ***, 2002; ***, 2010; Hoertel et al., 2014).

The inadequate use of dairy products was less frequent. Nevertheless, one out of two students did not use these type of products on a daily basis, which could influence daily calcium intake, with negative consequences on the development and maintenance of healthy bones and an increased risk of osteoporosis (***, 2002; ***, 2010).

Secondly, many health-risk behaviors were found to be interrelated rather than being a collection of independent activities. A percentage of around 80% of the subjects were involved in more than one unhealthy alimentary habit, with variations from 70% among junior high school students to 90% among university students. This shows that engagement in multiple unhealthy eating behaviors starts in junior high school and increases with age. This co-occurrence increases the risk of nutritional and health problems, also suggesting that people that are involved in one risk behavior such as skipping breakfast could be involved in other unhealthy eating behaviors, too.

Thirdly, several gender differences were found, some unhealthy alimentary habits being more frequent among girls (such as skipping breakfast), others among boys (e.g. inappropriate consumption of fruits); some of the gender differences found also varied between the three age groups. The co-occurrence of unhealthy alimentary habits was noticed in both girls and boys, the main gender difference being the fact that the presence of all four investigated unhealthy eating habits was more frequent among girls in the case of younger junior and senior high school adolescents, while a reverse situation was encountered among university students.

This study is subject to limitations. Due to funding and logistical restrictions, the study did not include a national representative sample, it involved only school youths and did not include out-of-school adolescents. This inevitably limits the generalization of the findings of the present study beyond its sample. Hence, future studies should use national representative samples and try to include out-of-school young people as well. Another common limitation of most studies on this topic is reliance on the adolescents'

self-reports. Although some respondents may not have reported truthfully, the likelihood of honest responses was maximized in this survey by conducting it anonymously. Future studies should also focus on factors that influence the food choice of different age and gender groups and identify what actions and messages could be appropriate in order to promote healthy nutrition for different categories of adolescents.

Conclusions

1. The results of the study show that many Romanian junior and senior high school students as well as university students engage in unhealthy alimentary behaviors that place them at risk for health and physical development problems, and that a co-occurrence of several unhealthy behaviors is observed.

2. These data call for actions aimed at helping Romanian young people to adopt healthy eating behaviors.

3. The co-occurrence of several unhealthy alimentary habits underlines that comprehensive programs, addressing several components of healthy nutrition, are required for Romanian young people.

4. The findings related to gender differences identified by our study emphasize the necessity of studying in more details the gender differences with respect to the alimentary habits of different age categories of Romanian young people, as well as several factors (socio-economic status, knowledge of and attitudes regarding healthy nutrition, body image and weight management, etc.), which could influence these behaviors; this information is needed in order to develop educational programs that are age and gender sensitive.

Conflicts of interests

The authors have no conflict of interest to declare.

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A motion capture and analysis system to aid the physician during the motor recovery of patients

Un sistem de captură şi analiză a mişcărilor pentru a ajuta medicul în recuperarea motrică a pacienţilor

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Abstract

Background. Ideally, each patient who is recovering his motor functions should benefit from a customized program. Unfortunately, in practice this does not happen, due to high costs: frequent access to a motion analysis system is mandatory. Such systems are expensive and rare, especially in less economically developed countries. A cheap and portable solution for this motion analysis system would help solve the problem.

Aims. This paper presents a solution in terms of improving the motor function recovery program of patients, by using an affordable and portable motion capture and analysis system on their gait.

Methods. By using a motion capture and analysis system, we can obtain a series of specific experimental data for a patient who is undergoing a motor function recovery period. The data is collected frequently throughout the recovery period. Experimental data based on the methodology presented in this article provides a series of parameters that may constitute elements of decision regarding the design of the recovery program of motor function of a patient, the goal being to obtain a personalized recovery program for each patient.

Results. In the article we present a case study of one patient who was surgically treated with a total knee prosthesis as a result of knee osteoarthritis. We clearly show how, by using information obtained from the analysis of movement, the physician can be assisted in making decisions on the patient's recovery program.

Conclusions. A motion capture and analysis system such as the one presented in this article, which is inexpensive, portable and designed for frequent use, is a solution for many patients who are undergoing the recovery of motor functions. The advantages of such a system are that it is inexpensive, portable, and accessible.

Key words: motion analysis, biomechanics, medical recovery.

Rezumat

Premize. În mod ideal, fiecare pacient ce îşi recuperează funcţiile motrice ar trebui să beneficieze de un program personalizat. Din păcate, în practică acest lucru nu se întâmplă, datorită costurilor foarte mari: este necesar accesul frecvent la un sistem de analiză a mişcării. Astfel de sisteme sunt scumpe şi rare, mai ales în ţările mai puţin dezvoltate economic. Din perspectiva acestui sistem, o soluţie ieftină şi portabilă ar ajuta în rezolvarea problemei.

Obiective. Articolul de faţă prezintă o soluţie în ceea ce priveşte îmbunătăţirea programului de recuperare a funcţiilor motrice ale bolnavilor aflaţi într-un astfel de program, cu ajutorul unui sistem de captură şi analiză a mersului, portabil şi accesibil ca preţ.

Metode. Cu ajutorul unui sistem de captură şi analiză a mersului se obţin o serie de date specifice fiecărui pacient aflat în perioada de recuperare a funcţiilor motrice. Acestea sunt colectate frecvent de-a lungul perioadei de recuperare. Datele experimentale, obţinute pe baza metodologiei prezentate, oferă o serie de informaţii ce pot constitui elemente decizionale în ceea ce priveşte proiectarea unui program personalizat de recuperare a funcţiilor motrice ale unui pacient.

Rezultate. În articol prezentăm un studiu de caz privind recuperarea unui pacient ce a suferit tratament chirurgical de înlocuire a genunchiului, în urma gonartrozei. Se demonstrează cum, folosind informaţiile obţinute în urma analizei mişcării, medicul poate fi ajutat în a lua decizii privind programul de recuperare al pacientului.

Concluzii. Un sistem de analiză a mişcărilor umane în timpul mersului, ieftin şi portabil, destinat utilizării frecvente, reprezintă o soluţie pentru foarte mulţi pacienţi în vederea recuperării funcţiilor motrice. Avantajele unui astfel de sistem, faţă de unul profesional sunt: preţul, portabilitatea şi accesibilitatea.

Cuvinte cheie: analiza mişcării, biomecanică, medicină de recuperare.

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Introduction

There is an essential difference between theory and practice, between what exists and what is actually used in rehabilitation medicine. Despite the theoretical existence of sophisticated devices and tools developed by scientists and renowned manufacturers in the field, when it comes to everyday life, to ordinary medical centers, even well-equipped ones, this sophisticated equipment cannot be practically found. Usually, the reasons for this are purely economic: either there is not a sufficient number of patients for investment in such equipment to make profit, either the number of patients is sufficient, but their financial possibilities are not enough to recoup the investment in time. The research idea in this article started after being in touch with the harsh reality, in which it was observed that in less developed countries, not only the equipment designed for rehabilitation medicine is missing, but also the methods of treatment (modern medical interventions) are not there yet or they have just recently appeared, but usually in private clinics at high costs.

When it comes to the area of recovery of motor functions of a patient, if we eliminate the situations (very few in number) where modern equipment is frequently used, we end up with the majority of other situations where the whole procedure is recommended by medical doctors and derives mainly from the physician's skills and experience. Basically, there are a number of standard methods and exercises that the patient must follow, and these are recommended in a certain proportion and order, following a plan based almost exclusively on the physician's experience and instinct. The only information that might help the physician during the recovery period while the above procedure is followed (usually months) is extracted from the patient's regular appointments. In our opinion, there is a profound need to improve the way things are at the moment in this field, for two main different reasons: we consider that the recovery plan should be established based on some form of gait data collected from the patient, because each patient is different from the other, and we know that the efficiency of the recovery procedures varies from patient to patient. We believe that each situation should be managed individually, based on more regularly collected data than just the physician's experience and "feeling" (Berme et al., 1990).

Hypothesis

In this article, we present a solution to the problems associated to the way rehabilitation medicine is practiced in regular clinics and rehabilitation centers, mainly focusing on the area of recovery of motor functions of patients after accidents, surgery, etc. We will propose a motion capture and analysis system which is cheap, portable and easy to install at the patient's location. The system will be used (ideally) daily by the patient to collect gait data, which will be analyzed and presented in such a way that the physician will be able to draw conclusions and eventually modify the recovery plan based not only on his experience and skills, but also on this data. We will present the way the system works, the way data is gathered, analyzed and presented, the system's advantages and limitations and, in the end, we will show a practical example with real experimental data collected from a patient, using this system.

Material and methods

The human motion analysis system proposed in this research is based on experimental data collected using video materials. Essentially, the patient is filmed during his recovery period, as frequently as possible, while walking. Markers are attached to the patient for at least the three main joints of the leg (ankle, knee and hip) and their trajectory is recorded over time (Fig. 2). Using software applications, the path of the marker is transformed into a set of coordinates in time, which can then be mathematically processed to obtain a mathematical model that can be further processed to extract the desired information (Mihalcica et al., 2014b; Meredith & Maddock, 2005).

The idea behind this system's components and installation conditions was to be able to easily install such a system at home. At minimum, a video camera able to record using at least 125 frames per second is recommended. The video recording will take place in the exact same spot, ideally in front of a monochrome wall. The starting and ending positions for the patient's motion will be clearly marked. The video camera will be installed at the knee level (the middle of the image captures the knee), perpendicular to the walking path (so that it captures the walking of the patient) at the same distance in every session. We recommend this distance to be 2 m or 2.5 m, but other distances work as long as they are specified; installing the system at home means that we should be able to adapt it to the room's shape and dimensions (Mihalcica et al., 2014a).

There will be markers installed on the patient's ankle, knee and hip and on different other areas of interest, if that is the case - ideally, the markers should have a high contrast color when compared to the patient's clothes (see Fig. 1 - we suggest to use the same markers and the same clothes in all the sessions, if possible). Also, a portable computer is needed to connect the video camera and to save the video materials during the walking sessions.

From a software point of view, we need an application able to capture motion data from a video material. Ideally, we want this application to be a well known one, decent in price and developed by a renown company in the field. Considering these conditions, we chose Adobe After Effects as the application to use for data gathering from the video materials (Mihalcica et al., 2010; Ren et al., 2007).

Fig. 1 – A sample of a video recording session. There is high contrast between the markers and the subject's clothes, also between the clothes and the wall.

We also need some software to use in order to process the raw data obtained with Adobe After Effects.

We used Microsoft Excel tables to store the data gathered with Adobe After Effects, and we used MATLAB programs (which we wrote) (Chapman, 2008) to process this data mathematically and to obtain the models needed for each patient (again, two popular applications) (Smith, 2010), (Chapra & Canale, 2006).

The patient will be asked to stand at the starting point (clearly marked on the floor, starting from left to right, depending on the foot of interest - foot undergoing surgery, or an accident, etc.) with both feet on the ground. He will then start walking, in a normal, unforced and relaxed manner, from the starting point to the end point. This walk will be video recorded using the camera and one video will be individually saved. Then the procedure is repeated, the more walks, the better the results - we recommend to have at least 10 walks per session, but we also recommend for the patient to stop when walking becomes unpleasant (there is a high chance that the patient will change his walking habits when he/she feels pain, and this would alter the results in an unwanted way). These walks will be gathered and the video materials will be saved - we will consider this and will refer to it as a ”walking session” from now on (Lee & Cohen, 2006; Zhou et al., 2013).

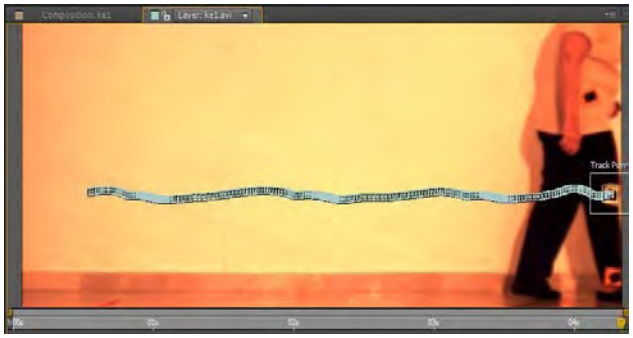

Fig. 2 – Using the system to follow the knee marker during one walk - screenshot from Adobe After Effects, where the element that captures the trajectory can be seen.

These walking sessions will take place with a high frequency (a strong point of our system is the fact that it can be installed at the patient’s home or at the recovery location) - we recommend to have one walking session at least once per week, ideally every 3 days. The data will be gathered and compared in time, using mathematical models (Safonova et al., 2004). There are many factors which can be taken into consideration, starting from the basic shape of the motion (seeing, for example, how high the patient can lift his/her knee or ankle) to more specific things such as velocity during gait (full-length velocity or segmented velocity, such as the velocity of the ankle when lifting the leg), step and stride length, etc. This data will change in time and can give an idea about how the recovery is going. Based on this data, his expertise and skills, the physician can then modify the recovery plan for the patient (Jordan et al., 2007).

Some special situations might arise. There is the common case when the patient uses support during his recovery program. This support can be (most common examples here) a walker, crutches or a walking stick. Also, a very common situation, the patient changes support during recovery: he starts by using the walker, after a few weeks he changes to crutches, and then to the cane or even to no support at all. These periods should be approached separately. The walking sessions with the walker should be analyzed separately, then the crutches, etc. In fact, we hope that our system would actually be able to give „clues” for when the change should happen (and if it should happen) (Nixon et al., 2006). From what we experienced with our practical cases, after the patient’s walk stabilizes and there is no improvement for a few walking sessions with some form of support (the main parameters remain the same - have an acceptable variance), it is recommended that the patient will try some new, less restrictive form of support (Hardt & Von Stryk, 2002).

We followed the recovery of motor functions in a female subject, 59 years old, her physical parameters being 150 cm and 72 kg. She suffered from knee osteoarthritis, which was surgically treated with total knee prosthesis. Also, procedures took place aiming to correct the morphology disorders of the knee, by removing degenerate tissue, in order to allow articular regeneration. An informed consent of the subject participating in the research was obtained.

The MC2 Biotechnic prosthesis with mobile plate and posterior stabilization was used for the total knee prosthesis procedure (it is considered the ”standard” prosthesis, the main prosthesis used for this procedure in Romania).

Our video recordings and measurements were made at 63 frames per second, using the high-speed AOS X-PRI camera. The camera was installed in lateral direction, visually perpendicular to the direction of the subject’s walk (the camera records the sagittal plane of the subjects during gait).

The high-speed camera was placed at a distance of 280 centimeters from the walking path, and the distance that the subjects cover during their walk is 230 centimeters.

Results

Multiple measurements were made during the full period of recovery for this subject, but considering the aims of this paper, we will focus on the ones corresponding to the moment when the patient was instructed (by the physician) to change the recovery exercises. We will present the data and the parameters obtained in order to better understand how our system can help the physician with this decision.

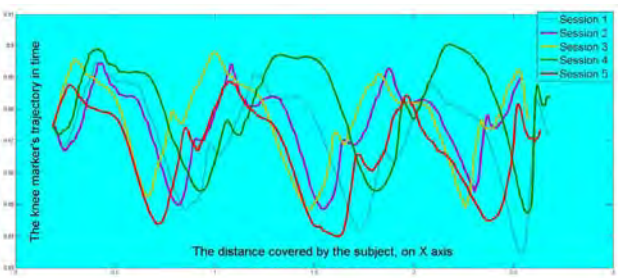

Fig. 3 – The first five sessions of gait, without big differences between them.

In Fig. 3, we can observe the knee marker trajectory during the first 5 recorded sessions. By simply studying

the trajectories, we can easily see that there were no major ”changes” in the gait at that time of recovery. The next figure (Fig. 4) captures and presents the moment when the first changes were visible.

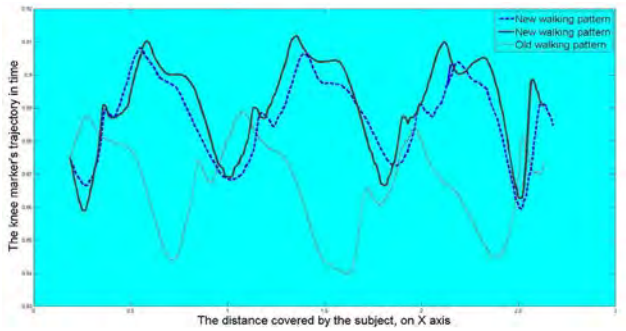

Fig. 4 – The moment when the first changes in gait appeared - obvious changes.

The patient strictly followed the original recovery program and the recovery exercises. The gait pattern changed rapidly with time, and after two more sessions, it stabilized to another trajectory, as it can be seen in Fig. 5.

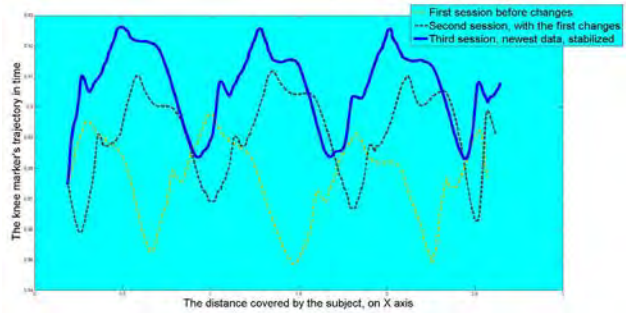

Fig. 5 – The gait stabilized close to the upper trajectory.

These representations were used as the first parameter that influenced the decision to change the recovery program (the number of some physical exercises was increased, new physical exercises were introduced while others were removed). It can be easily seen that, with time, the patient could lift her leg higher and higher, up to a point where there was no more improvement. It was the first clue that the patient needed a change in the recovery program for a faster recovery process - but it was not the only parameter that could influence the decision. We also took into consideration the velocities of the knee, both on the X and Y axis (Tofan et al., 2009). We will present those below.

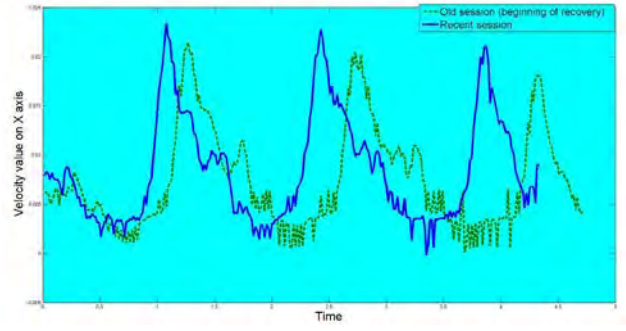

Fig. 6 – The velocity of the knee marker, on the X axis.

The information in Fig. 6 is very important. It tells us that during the recent session, the patient can walk the distance faster (the time is shorter, the overall velocity is higher) and the top velocity is higher than the one corresponding to the old session. This means that the patient performs overall in a better way than before. We kept measuring the velocities until the improvements were no longer relevant. This was the second parameter that could be considered when making the decision to change the recovery program.

It is important to note that all this analysis was (and must be) done under the strict supervision of the physician (in the example above, we only notified the physician of the changes occurring in the patient’s gait and we let him perform the recovery procedure as he considered appropriate). There are lots of factors to consider here - for example, if the patient is walking with support and our analysis hints that he/she can change or drop the support (walker, cane, etc.), there might be the case that, despite the fact that the patient’s gait parameters stabilize, he/she still feels pain when walking without support, and (most likely) the physician should not force him/her.

In our situation, the measured parameters led to the idea that our patient recovered faster than expected. In other situations the opposite might happen, recovery might go slower than expected and the physician should delay some changes - this varies from patient to patient. Again, our system does not aim to influence an extreme decision, but to help the physician correlate his experience with some scientific data in order to make the best decision, which varies depending on the situation.

Discussion

Our procedure is designed in such a way that the collection of data can be performed easily even by individuals who are not comfortable using computers, as long as the instructions are followed. However, some computer interaction is needed (usually, only clicking a few buttons). Unfortunately, the patient cannot perform the operation alone, some other individual has to help.

We strongly recommend that each patient be approached individually and that the results obtained from other patients already recovered using the aid of this system, have mostly an informative meaning. The data gathered from previous patients is still valuable and can be used as a calibration for the new patient’s analysis, but only at the start of the analysis program and only if the physical characteristics (height, weight, age, gender) and the medical situation somehow match. Our practical experience with the system tells us that some patients recover faster, others slower, even if the other physical parameters of the patients are close in numbers.

There is no ”unique model” which can be generally applied and each walking session must be analyzed individually. The collection of data using Adobe After Effects and then the processing of data using MATLAB applications is demanding work. Depending on the data obtained and the aim of the analysis, the MATLAB code might need to be changed (this rarely happens, and mostly when there is the need to analyze some specific, out of ordinary parameter). Even if the system is affordable and easy to use, there is a cost in terms of time associated with its use.

Conclusions

1. Using the system presented in this paper, we managed to offer a good prediction about some steps in the recovery of a patient who underwent a knee replacement procedure as treatment for knee osteoarthritis.

2. More patients are in the process of recovery (however, the data gathered so far already allow for some good conclusions). This system successfully aids the physician by offering him experimental data in order to better analyze the patient's recovery. The data obtained using the motion capture and analysis system should be seen as a support for the physician, and, in correlation with his experience and skills, should help him during a patient's recovery process. One of the main benefits of using a system as the one presented in this paper is that such a system allows for each patient to be approached individually so that his/her treatment is specifically adapted to him/her, which, in our view, is the correct way medicine should be practiced. The system is affordable, portable, can (and should) be used frequently and there is no need for the physician to be involved in the collection of the experimental data, as long as the conditions of use are strictly followed.

3. In the future, we aim to improve both the system's functionality and the way the analysis is done. After gathering enough experimental data from a lot of patients, we aim to find more correlations between gait patterns and the way the recovery process develops in time, and in the end to determine more scientific parameters which can be used during the recovery process.

Conflicts of interests

There were no conflicts of interests.

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Functional training impact on the cardiovascular adaptation to exercise of junior female volleyball players

Influenţa antrenamentului funcţional (functional training) asupra capacităţii de adaptare cardiovasculară la efort a jucătoarelor de volei junioare I

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Abstract

Background. This study started from the fact that over the past time period, in order to obtain an optimal physical level specific for sport games, professionals together with coaches have tried to include some alternative motor activity programmes from other sport branches such as aerobic gymnastics, fitness etc., in physical training.

Functional training has, through the methods and materials used, the highest impact with regard to the improvement of functional capacity on 1st age class junior female athletes.

Aims. This study aimed to emphasize the functional training impact on the functional capacity development of 1st class junior female volleyball players.

Methods. The study was carried out over a period of 11 months (July 2013 – May 2014), during the National Volleyball Championships, 2013-2014, for 1st class junior female players. Tests were carried out on 7 volleyball players (6 players + 1 libero player), at the end of the games. Female players were tested in 2 games of the Championship round, in 2 games of the Championship return, in the semi-final games and in the final tournament.

Female players who participated in this experiment were assessed by the Ruffier test. This exercise test allows the investigation of the athletes' functional capacity from the point of view of the assessment of cardiovascular adaptation to exercise.

Results. By comparing the results obtained by the athletes from the two groups included in this study, an improvement of the functional capacity of the players in the experimental group was proven, in comparison to that of the players in the control group.

Conclusions. The study results obtained demonstrate that the means and methods in functional training are much more effective with regard to the optimization of the functional capacity of 1st class junior female volleyball players compared to traditional training methods.

Key words: functional training, functional capacity, volleyball, 1st class junior female players.

Rezumat

Premize. Cercetarea de faţă a pornit de la premiza conform căreia, în ultima perioadă, pentru obţinerea unui nivel de pregătire fizic optim specific jocurilor sportive, specialiştii împreună cu antrenorii au încercat introducerea în cadrul pregătirii fizice a unor variante de programe de activităţi motrice din alte ramuri sportive, precum gimnastica aerobică, fitness etc.

Antrenamentul funcţional are, prin mijloacele şi materialele folosite, cel mai mare impact privind îmbunătăţirea capacităţii funcţionale, raportându-ne la categoria de vârstă junioare I.

Obiectiv. Prin această cercetare s-a urmărit evidenţierea efectului antrenamentului funcţional asupra dezvoltării capacităţii funcţionale a voleibalistelor, junioare I.

Metode. Cercetarea s-a efectuat pe o perioadă de 11 luni (iulie 2013- mai 2014), de-a lungul Campionatului Naţional de Volei ediţia 2013-2014, junioare I. Testările au fost efectuate pe 7 jucătoare (6 jucătoare + 1 libero) şi au avut loc la încheierea meciurilor. Jucătoarele au fost testate la 2 meciuri din turul campionatului, la 2 meciuri din returul campionatului, la turneul semifinal şi la turneul final.

Jucătoarele care au participat la acest experiment au fost evaluate prin proba Ruffier. Această probă de efort permite investigarea capacităţii funcţionale a sportivelor, din punctul de vedere al evaluării adaptării cardiovasculare la efort.

Rezultate. Prin compararea rezultatelor obţinute în cadrul experimentului de sportivele din cele două loturi supuse acestei cercetări, s-a putut constata îmbunătăţirea capacităţii funcţionale a jucătoarelor lotului experimental, în detrimentul celor din lotul de control.

Concluzii. Rezultatele cercetării obţinute demonstrează faptul că mijloacele şi metodele din cadrul antrenamentului funcţional sunt mult mai eficiente în ceea ce priveşte optimizarea capacităţii funcţionale a jucătoarelor de volei junioare I, faţă de metodele clasice de antrenament.

Cuvinte cheie: antrenament funcţional, capacitate funcţională, volei, junioare I.

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Introduction

To obtain high-performance results in the "volleyball game, it is needed to review the training concepts in order to take into consideration the parallel approach of all training elements" (Cojocaru & Cojocaru, 2012).

Physical training represents the support for all the other training elements, being considered a basis for the entire training process and a foundation for the approach of the other training elements.

"Physical training represents a true methodological reference, being one of the most significant requirements for obtaining high performance, whose effective management must rely as objectively as possible on continuous monitoring and assessment, throughout the process, by those responsible for the management process." (Neagu, 2012)

Physical training along with tactical, technical, theoretical, biological-psychological, artistic training and recovery are the basis for obtaining success and performance in sport.

"Physical training consists of a system of measures, means and methods which ensure the development of morphological indices, functional capacity, basic motor skills specific for different sport branches" (Teodorescu, 2009).

"Physical training in volleyball requires the development of basic and special motor skills, harmonious physical development and the training of joints and segments significant for volleyball" (Mârza, 2006).

The development of scientific research specific for the sport field is due to the high interest, shown over the past time period, in obtaining sports performance in optimal real time that can manifest in a more effective form.

Lately, in order to obtain an optimal physical level specific for sport games, professionals together with coaches have tried to include some alternative motor activity programmes from other sport branches such as aerobic gymnastics, fitness etc., in physical training.

According to research carried out by professionals in the field (Bota, 2007; Dragnea, 1984; Drăgan, 2002), functional training must align with general motricity and sometimes, it must prevail.

"Aerobic activity, by the means and methods applied, has significant pedagogical, biological, psychic and social results" (Dobrescu, 2008).

The implementation of functional training results in functional adaptations at body level, which induce in their turn prophylactic effects for different disorders.

Functional training is a full physical training system aimed at training the entire human body in the way it will be used during competitions, being currently the most effective coaching form (Boyle, 2004).

According to authors Reiss & Prévost (2013), an effective functional training programme must observe the following steps: *discussion, observation, movement, exercise.* These 4 elements represent *the "DOME System"*.

Discussion: it takes place between the coach and the athlete and covers the following matters: the athlete's background, medical history, targeted goals, etc.

Observation: before establishing the exercise programme for an athlete, the assessment of his/her static posture is required**.**

Movement: the execution of some movements may give the opportunity to observe some functional imbalances.

Exercise: there are 2 types of exercises: basic and corrective.

One of the main goals of optimizing the physical status of 1st class junior female volleyball players is the improvement of the main functions (cardiovascular and respiratory) of the human body.

Bota (2000) considers that practicing physical exercises is important because this brings many benefits to the human body systems and functions.

The most important benefits are:

a) *The cardiovascular system*

The functional adaptations that take place at this level lead to an increase in the amount of blood that can be pumped by the heart, increasing the vascular blood flow. Blood becomes fluid and circulates more easily through the blood vessels.

b) *The respiratory system*

The pulmonary capacity significantly increases and the lungs become able to ventilate a higher air quantity per minute.

c) *The musculoskeletal system*

Fitness exercises increase both muscle resistance, strength, elasticity, and bone system resistance, preventing motor system trauma.

d) *Fat tissue*

One of the big issues, regardless of gender, is weight or more precisely, fat mass. By exercise, the amount of fat tissue is reduced.

e) *Carbohydrate metabolism*

Functional adaptation appears when the muscle capacity to extract or take over glucose from blood increases, which is very difficult to obtain in the absence of physical activity.

Physical exercise increases the capacity of muscle to take over fats from the blood and to use them to produce energy, decreasing in this way the risk of atherosclerosis.

f) *The body defense function (immunity)*

Sport improves the immune system capacity to respond to microbial aggression, which minimizes the occurrence of infections.

g) *Digestive processes*

Intestinal transit is improved by exercise, which eliminates constipation and prevents colon cancer.

h) *The nervous system*

Movement coordination is improved and very important reflexes are formed in daily life.

i) *Cognitive functions*

Feedback speed improves and reactions to different stimuli become more rapid.

j) *Psychic-social behavior*

Functional training as a physical training method primarily aims, through the targeted objectives, at the muscle toning and the adaptation of the human body to efforts of variable intensities.

Timmermans et al. (2010) consider that in order to be effective, a functional programme should include different elements that can be adapted to the needs or goals of each and every athlete.

The attractiveness and diversity of functional training programmes bring more involvement with obvious effects on the functional component of 1st class junior female volleyball players.

Functional training improves human body balance, coordination, mobility, strength and resistance, while the exercises used during functional training have positive effects on the respiratory, cardiovascular and muscle-ligament systems.

Functional training has its roots in recovery gymnastics. Physiotherapists trained the injured athletes with a view to their comeback to sport, using global training very similar to the effort and movements typical of competitions.

Functional training consists of physical movements typical of daily life and implies the elimination of very heavy weights and fixed apparatus, using the weight of the human body, involving both free movements and special training accessories.

During functional training, the correct execution of exercises will lead to the development of the mobility and stability of athletes. The improvement of these abilities reduces the risk of accidents suffered during effort (Orr, 2013).

Functional training develops strength by using techniques intended for the whole human body (Radcliffe, 2007).

Specific functional training means represent one of the ways for increasing the interest and creative activity of 1st class junior female volleyball players.

The researchers at the CHEK Institute (Corrective Holistic Exercise Kinesiology) have elaborated a handbook to determine the validity of functional exercise. This handbook comprises the following characteristics of functional exercises (1):

1. Getting postural reflexes of balance and straightening
2. Keeping the center of gravity over the support area:
   a) Dynamic posture component
   b) Static posture component
3. Generalizing the motor compatibility programme
   a) Open/closed channel compatibility
   b) Improvement of relevant biomotor ability:
      - Balance reaction
      - Position recovery reaction.

A study performed by Maiorana et al. (2000) investigated the effects obtained after cardiorespiratory circuit fitness training. This study, which included 13 persons, lasted 8 weeks and aimed to monitor the changes in muscle strength and body composition. After the 8 weeks during which cardiorespiratory circuit fitness training was applied, increases in VO2 from 19.5 to 22 ml/kg/min were recorded. The sub-maximal exercises performed caused changes in cardiac frequency. Cardiac frequency was lower after training, between 60 and 80 bits per minute. Following the application of cardiorespiratory circuit fitness training, functional capacity and muscle strength were improved in the studied athletes.

Due to the changes induced by physical effort made during functional training, a number of adaptations of the cardiovascular system develop in time, which could also lead to higher performance in competitions.

The purpose of physical training in volleyball is to optimize exercise capacity; optimal specific physical training also plays a significant role in the improvement of the biomotor ability of female athletes. The inclusion of adapted functional training programmes may contribute to the increase of the attractiveness and effectiveness of training, improving the physical status for the effort typical of the high-performance volleyball game.

Objectives

The study aims to emphasize the role of functional training in the optimization of the functional capacity of 1st class junior female volleyball players.

Hypothesis

It is assumed that the modernization of the physical training programme content for 1st class junior female volleyball players by including some specific functional training means will determine the optimization of the functional capacity parameters of 1st class junior female volleyball players.

Material and methods

We mention that according to the Helsinki Declaration, the Amsterdam Protocol and Directive 86/609/EEC, the approval of the Ethical Commission of the University of Medicine and Pharmacy Tîrgu-Mures was obtained. The informed consent of the participants in this research was given.

Research protocol

a) *Period and place of the research*

The research was carried out over a period of 8 months (September 2013 – May 2014), during the National Volleyball Championship for 1st class junior players, 2013-2014, on a number of 14 players, divided into two groups: the experimental group and the control group. The experimental group athletes were functionally trained based on adapted functional training programmes, while the control group athletes were traditionally trained.

The players from both groups participated in four training sessions weekly.

b) *Subjects and groups*

The study sample included 14 1st class junior female athletes aged 16-18 years.

All subjects and their parents consented to the publication of the results of this research.

The experimental group was formed by 7 athletes, members of the CSU Medicine CNUE Tg. Mureş team, while the 7 athletes of the control group were members of the CSS Blaj team, matched for age with the athletes of the experimental group.

c) *Tests applied*

To test the cardiovascular functional capacity, the Ruffier test was used.

Tests were carried out at the end of the following games: 2 matches in the Championship round (scored in tables M1, M2), 2 matches in the Championship return (scored in tables M3, M4), 4 semi-final games (scored in tables M1, M2, M3, M4) and 5 games in the final tournament (scored in tables M1, M2, M3, M4, M5), in all the players.

d) *Methods applied*

The methods used in this research were: data collection

methods, namely study of reference materials (specialized and related field materials); experiment (the independent variable was applied to the experimental group, which caused adapting phenomena); tests (the standardized Ruffier test).

The research assesses only the cardiovascular activity adaptation to effort following the application of complex functional training, which also influences other systems that will be subsequently investigated.

The means used in the training of the experimental group consisted of exercises performed with the body weight, sets of exercises with the medicinal ball, exercises with dumbbells, barbells, TRXs, kettlebells, the oval ball etc. (Table I).

During general physical training (July 2013), work consisted of special functional training programmes (60-80 min).

During the month of August 2013, special physical training was carried out: during that period, the athletes were trained twice a week (60 minutes) by using specific functional training means, while during the other 3 training sessions, they were technically trained. We mention that in the final part of the 3 technical training sessions, adapted functional training circuits were performed (20-30 min), while in the warm-up part of these sessions, athletes worked with aerobic gymnastics means.

From 1 September to 14 December 2013, special technical and tactical training was performed. During this time period, at the end of the training sessions, adapted functional training circuits were performed (20-30 min).

During the transition period (16 December 2013 - 25 January 2014), training was carried out as follows: the functional training programme was carried out twice a week between 16-23 December 2013 and 6-11 January 2014, while at the end of the other 3 training sessions, functional training and stretching circuits were performed.

Starting with 11 January until the end of the Championship (6 May 2014), special technical and tactical training was performed again, by using at the end of the training sessions adapted functional training (20-30 min) and stretching circuits.

As a novelty, the 1st class junior female players were trained by using the core training programme which addresses the muscles that support posture and link the limbs to the trunk, abdominal belt, scapular belt, posture muscles.

The control group athletes were traditionally trained based on traditional training programmes.

Results

Following the functional test applied to the 7 athletes of the experimental group, the following results were seen:

The volleyball game coordinator (CA) achieved an improvement of aerobic exercise capacity from the start until the end of the game, according to the Ruffier test. According to Table II data, in the first Championship game, CA had an RI index equal to 4, which represents a good exercise capacity, while, in the final tournament, the player

Table I

Functional training planning model.

Content					August Weekly cycle - 4 training sessions			
Means used					I	II	III	IV
Speed of		Reaction		Reps	8x	10x	12x	12x
		Execution		Reps	8x	8x	8x	12x
		Repetition		Reps	6x	6x	10x	10x
		Movement		Reps	6x	6x	10x	10x
		Acceleration		Reps	6x	6x	10x	10x
Global resistance		Uniform rhythm		Meters	3000	3500	4000	4000
		Varied rhythm		Meters	600	600	800	800
		Unleveled surface		Meters	1000	1400	1700	1700
		CORE Training Exercises		Reps	8x	8x	12x	16x
Strength	Upper body	Dumbbell exercises (side flapping, lateral raise of dumbbell, alternative forward raise of dumbbell, arm bending)		Kg.	1.5	2	2.5	3
		TRX exercises		Reps	8x	8x	16x	16x
		Kettlebell exercises		Kg.	8x	8x	16x	16x
		Abdomen	Mattress	Reps	20x	30x	40x	50x
			Inclined plane	Reps	20x	30x	40x	50x
			Time Const.	Reps	30	30	30	30
		Raising thighs	On wall bar	Reps	20x	25x	30x	30x
			On box	Reps	20x	25x	30x	30x
		Extension /Straightening		Reps	15x	20x	25x	30x
		Elastic tape exercises		Reps	8x	8x	16x	16x
Strength	Lower body	Genuflexions	With bells	Kg.	8x	8x	16x	16x
			With the bar	Kg.	8x	8x	12x	12x
			With TRX	Kg.	8x	8x	16x	16x
		Semigenuflexions/Toe raises		Reps	8x	8x	16x	16x
		Lunges		Reps	8x	8x	16x	16x
		Stepper exercises (straightening, lunges)		Reps	8x	8x	16x	16x
		Leg flexion		Reps	8x	12x	16x	20x
		Lunging gait		Reps	8x	8x	12x	12x
Spring	Plyometric exercises	Genuflexions with vertical raise, jumps on stepper, lateral jumps from one leg to the other)		Reps	12x	12x	16x	16x
		Jumps over obstacles, low fences		Reps	12x	12x	16x	16x
		Exercises on the training ladder		Reps	4x	4x	8x	8x
Skills	General			Min.	5	5	10	10

reached a very good exercise capacity characterized by an RI between 0 and 0.4. The difference between the first match test results and the final tournament test results was 4.4 units, as showed in Table III.

The left back player (LB), a universal player, had a good result (RI = 3.6) at the beginning of the Championship as showed in Table II, reaching values between -1.2 and 0.4 for RI at the end of the Championship, the difference being 4.8 units according to Table III. The initial value (3.6) represents a good exercise capacity and the final tournament values represent a very good exercise capacity.

The pivot-line player (PP) had, after the first Championship game, an RI value of 2.8 as showed in Table II, representing a good exercise capacity. This player reached in the final tournament RI values between -1.2 and -1.6, showing a very good evolution represented by the difference of 4.4 units between the first test results and the final test results, as showed in Table III, due to physical training performed using specific functional training means.

During the Championship, the middle back (MB) player of the CSU Medicine CNUE Tg. Mureş team improved her functional capacity, obtaining at the first testing an RI of 2.8, a good result, and reaching at the final tournament test RI values between -0.8 and -1.6, according to Table II, which means a difference of 4.4 units between the first test results and the final test results, as showed in Table III, due to physical training performed using specific functional training means.

The right back player (RB) had a good result (RI=1.6) at the beginning of the Championship, as showed in Table II, reaching a value of -3.6 at the end of the Championship, a very good exercise capacity for this player, the difference being 4.4 units according to Table III, which represents an increase of 275%, according to Table III data, due to physical training performed using specific functional training means.

The left wing player (BR) obtained at the first testing an RI value of 2.0, a good result, as showed in Table II, which indicates a good exercise capacity, while at the final tournament test, RI values were between -3.2 and -2.8, a very good exercise capacity. This player had an evolution of 4.8 units between the first test results and the final test results, as showed in Table III.

The libero player (LP) of the Tg. Mureş team obtained at the first testing an RI value of 1.6, which represents a very good value for the exercise capacity of the human body. During the matches played, her RI value improved, according to Table II data, reaching values between 0 and -0.4 during the semifinal tournament, and the value of -2.8 during the final tournament, which means a very good exercise capacity in the semifinal. The evolution of this player during the Championship was 4.4 units.

In the control group, it can be seen that following the application of the Ruffier test, the athletes showed lower improvements in their functional capacity than those of the players in the experimental group for the tests applied at all times, with good RI values. We consider that this aspect is explained by the fact that the traditional training exercises applied and practiced do not mainly target functional capacity.

Discussions

Player BV of the control group had an RI value of 6.0 (proving a moderate exercise capacity), according to the Ruffier test results in the first games, as showed in Table II, and reached in the semifinal tournament an RI value of 5.6 (moderate exercise capacity) and in the final tournament, RI values between 4.8 and 4.0, representing a good exercise capacity. The evolution of this player between the initial and final testing was 2.2 units, which represents 33% as showed in Table III.

The universal player TI obtained in the first tests an RI value of 6.0, indicating a moderate exercise capacity.

Table II

Evolution of RI values in the experimental and the control group of players in the Championship round and return games, as well as in the semifinal and final games.

Indicator	Individual RI values for the experimental group							Individual RI values for the control group						
	CA	LB	PP	MB	RB	BR	LP	BV	TI	DF	MN	OP	PB	MI
M1-ROUND	4.0	3.6	2.8	2.8	1.6	2.0	1.6	6.0	6.0	5.6	4.8	6.4	4.8	4.8
M2-ROUND	4.0	2.8	2.8	2.4	2.0	2.0	1.6	6.0	6.0	5.6	4.8	6.4	4.8	4.8
M3-RETURN	3.2	2.8	2.0	2.0	1.6	1.6	0.8	6.4	6.0	5.6	4.8	5.6	4.8	4.8
M4-RETURN	3.2	2.0	1.6	1.6	1.6	1.2	1.2	6.4	6.4	4.4	4.4	5.6	5.2	5.2
M1-SEM	2.4	1.6	0.4	0.4	0	0.4	0	6.4	5.6	4.8	4.8	6.0	4.0	4.0
M2-SEM	2.4	1.6	0.4	0.4	0	0.8	0	6.0	5.6	4.4	4.4	5.2	3.6	3.6
M3-SEM	2.0	0.8	0	0.4	0.4	0	-0.4	5.6	6.0	4.4	4.4	5.2	3.6	3.6
M4-SEM	1.6	0.4	-0.4	0	0	0	0	5.6	5.6	3.6	3.6	4.4	3.6	3.6
M1-FINAL	0.4	0.4	0	-0.4	-3.2	-3.2	-2	5.2	5.2	4.0	4.0	4.4	2.8	2.8
M2-FINAL	0	0	-0.8	-1.2	-2.8	-2.8	-1.6	4.8	5.2	3.6	3.6	3.2	3.2	3.2
M3-FINAL	0.4	-0.4	-0.8	-1.2	-3.6	-3.6	-2	4.8	4.8	3.6	3.6	3.6	2.8	2.8
M4-FINAL	0	-1.6	-1.2	-0.8	-2.8	-2.8	-2.4	4.0	3.4	3.2	3.2	3.2	2.8	2.8
M5-FINAL	-0.4	-1.2	-1.6	-1.6	-2.8	-2.8	-2.8	4.0	3.4	3.2	3.2	3.2	2.8	2.8

Table III

Summary of the percentage increase achieved.

Name / Indicator	Individual RI values for the experimental group							Individual RI values for the control group						
	CA	LB	PP	MB	RB	BR	LP	BV	TI	DF	MN	OP	PB	MI
IT	4	3.6	2.8	2.8	1.6	2.0	1.6	6.0	6.0	5.6	4.8	6.4	4.8	4.8
FT	-0.4	-1.2	-1.6	-1.6	-2.8	-2.8	-2.8	4.0	3.4	3.2	3.2	3.2	2.8	2.8
Diff. IT-FT	4.4	4.8	4.4	4.4	4.4	4.8	4.4	2.0	2.6	2.4	1.6	3.2	2.0	2.0
% increase	110	133	157	157	275	240	275	33	43	43	33	42	42	42

In the semifinal tournament, the player obtained an RI of 5.6 and in the final tournament, RI values between 4.8 and 3.4, expressing a good exercise capacity. The difference between the initial and final test results is 2.6 units, according to Table III data.

The pivot player DF of the control group obtained following the first tests a result showing a moderate exercise capacity, and reached in the semifinal tournament RI values between 3.6 and 4.4, which indicate a good exercise capacity, and in the final tournament, an RI value of 3.2 (good exercise capacity), according to Table II data. Data in Table III indicate an evolution of 2.4 units between the final and initial test results of this player.

The middle-back (MN) player of the control group obtained at the first test an RI value of 4.8, indicating a good exercise capacity, and this value slightly improved during the Championship. Thus, in the semifinal tournament, player MB had RI values between 4.4 and 3.6 (good exercise capacity), reaching a 3.2 value in the final tournament. This player did not succeed in significantly improving her RI values either, mainly because she traditionally trained without focusing on the optimization of functional capacity. The difference between the initial and final test results of 1.6 units is still small, as showed in Table III, representing a capacity increase of 33%.

The left wing player obtained an RI value of 6.4 in the round and return game tests, as showed in Table II, representing a moderate exercise capacity. In the semifinal tournament, the RI value reached 4.4, representing a good exercise capacity, while in the final tournament, RI values ranged between 3.2 and 3.6, indicating a good exercise capacity. The evolution of this player was 33% according to Table III data.

The right wing player had a good exercise capacity in the first tests, represented by an RI value of 4.8, reaching 3.6 (good exercise capacity) in the semifinal tournament, and 2.8 in the final tournament, according to Table II data. The difference between the initial and final test results was 2.0, meaning an improvement of 42%, as showed in Table III.

The libero player of the control group had a good exercise capacity in the first round and return game test results, according to the RI value of 4.8. This value improved, as showed in Table II, reaching 3.6 in the semifinal and 2.8 in the final, which represents a good exercise capacity. The difference between the initial and final test results is 2.0, according to Table III.

Conclusions

1. By comparing the results obtained by the two groups - the experimental group and the control group, it can be seen that the athletes of the experimental group succeeded much better in improving their exercise capacity than the control group of athletes. Thus, the experimental group of athletes started from RI values indicating a good exercise capacity to finally reach higher RI values, showing a very good exercise capacity. The control group of athletes also succeeded in improving their exercise capacity, all the 7 tested players reaching RI values expressing only a good exercise capacity.

2. Following a brief analysis of the results obtained by the athletes of the two tested groups, we could find that the means used to optimize the functional capacity of the experimental group were more effective than those used by the control group. We may conclude that the results obtained confirm the research hypothesis.

3. The development and implementation of an adapted functional training exercise programme would be useful to improve and optimize the functional capacity of 1st class junior female volleyball players aged 16-18 years.

Conflicts of interests

There were no conflicts of interests.

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Study on the quantification of the motivational level of high performance rowers (Note II)

Studiu privind cuantificarea nivelului motivaţional al canotorilor de performanţă (Nota II)

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Abstract

Background. We started from the premise that motivation is a regulatory incentive for athletes, which dictates the choices made by each individual athlete to achieve sports performance.

Aims. The research was initiated with the aim of identifying the rowers' motivational performance. In this regard, we aimed to quantify the overall motivation and the three components of motivation: valence, expectancy and instrumentality.

Methods. To fulfill this goal, we used a questionnaire-based survey and the data obtained were processed using the statistical-mathematical method. The infrastructural level of motivation was calculated by determining the size of each dimension of motivation factors, based on which overall motivational force (FMG) and motivation instrumentality (IM) were calculated. Quantification was performed using the responses obtained for the content and context factors according to the Dunnett formula, 1972.

The features are based on the results of the questionnaire survey, rated on a motivational assessment scale with three parameters: high, medium, low, based on the scores assigned to each choice.

Results. The value recorded for FMG (6.65) indicates a medium level of the motivational structure among high performance rower students.

The relatively low result of instrumentality (5.55) is due to the values of the structural elements of motivation, valence and instrumentality, which shows that intervention is required by a specialist (psychologist) in training the rowers. Also, the direct intervention of coaches in collaboration with psychologists can improve performance by optimizing the rowers' psychological training.

Conclusions. The knowledge of the motivational level of athletes generates motivational strategies to optimize psychological training and maximize sports performance.

Key words: rowing, motivation, performance.

Rezumat

Premize. În abordarea problematicii circumscrisă temei am plecat de la premiza că motivaţia îndeplineşte o funcţie reglatoare în conduita sportivului, aceasta fiind procesul ce guvernează alegerile făcute de fiecare sportiv în parte pentru realizarea performanţei sportive.

Obiective. Cercetarea a fost iniţiată cu scopul de a identifica nivelul motivaţional al canotorilor de performanţă. În acest sens, a fost stabilit ca obiectiv cuantificarea motivaţiei globale şi a celor trei componente ale structurii motivaţiei: valenţa, expectanţa şi instrumentalitatea.

Metode. În vederea îndeplinirii obiectivului propus am utilizat metoda anchetei pe bază de chestionar, iar prelucrarea datelor obţinute s-a realizat prin metoda statistico-matematică. Nivelul infrastructural al motivaţiei a fost calculat prin determinarea mărimii fiecărei dimensiuni a factorilor motivaţiei, pe baza cărora s-a calculat forţa motivaţională globală (FMG) şi instrumentalitatea motivaţiei (IM). Cuantificarea s-a realizat prin utilizarea răspunsurilor obţinute pentru factorii de conţinut şi de context, în conformitate cu formula Dunnett, 1972.

Caracteristicile se pun în evidenţă pe baza rezultatelelor anchetei de tip chestionar, apreciate pe o scală de evaluare motivaţională cu trei parametri: mare, medie, mică, pe baza scorurilor atribuite fiecărei variante de răspuns.

Rezultate. Valoarea înregistrată pentru FMG (6,65) indică un nivel mediu al structurii motivaţionale în rândul studenţilor canotori de performanţă.

Rezultatul relativ scăzut al instrumentalităţii (5.55) se datorează valorilor înregistrate pentru elementele structurale ale motivaţiei, valenţa şi instumentalitate, ceea ce denotă faptul că este necesară intervenţia de specialitate (psiholog) în pregătirea sportivă a canotorilor. De asemenea, antrenorii prin intervenţie directă şi în strânsă legătură cu psihologul pot îmbunătăţi performanţele sportive optimizând pregătirea psihologică a canotorilor.

Concluzii. Cunoaşterea nivelului motivaţional al sportivilor conduce la dirijarea pregătirii acestora din perspectiva pregătirii psihologice.

Determinarea nivelului motivaţional al sportivilor generează strategii motivaţionale de acţionare pentru optimizarea pregătirii psihologice şi maximizarea performanţei sportive.

Cuvinte cheie: canotaj, motivaţie, performanţă.

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Introduction

Rowing is a prominent discipline of modern high performance sport, which has won many medals in sports tournaments worldwide.

The universality of sport, the altitude and instability of performance, as well as their continuous movement towards biological and psychological limits still unknown to man, invite us to reflection and analysis. Performance does not come from a cluster of facts and events, but is a product of the effects of the concerted action of objective and subjective factors.

Athletic performance is multi-determined and it is very difficult to establish which factor has the largest share when its level is at the upper limit of the individual's capacity (motor, functional, physical, etc.). It is clear that performance sport is about competing with space, time, gravity, nature, with others and/or oneself. This activity is part of the sphere of activities that manifest at the limit of the physical and mental possibilities of the individual.

Motivation is the result, the consequence of the interaction between the individual, the task to accomplish and organizational environment. It is „the extent to which a persistent effort is directed to achieve a goal" (Preda, 2006). Motivation is „internally exposed external causality" (Golu, 2005). Popescu (2009) considers that „subjective motivation is the premise for the formation of attitudes, which is based on needs that cause the individual to show a certain behavior".

From personal experience, we can say that motivation is the basic condition for sport and a lever for the production of performance. Motivation is the impulse that a person needs to choose to practice a particular sport and the aspiration to performance. In accordance with the mentioned above, a series of studies regarding the detection of motivation among young athletes, the identification of the dominant reasons for the practice of sport depending on the performance level of athletes, the detection of the motivational task and its intensity, as well as the identification of motivation to practice physical activity among adolescents have been conducted (Amici et. al., 2009; Coelho & Vasconcelos-Raposo, 2006; Rose et al., 2006; Pihu et al., 2006; Liang & Chun, 2004; Welde & Svebak 2008).

Hellriegel states that motivation must be seen as a „function of the relationship between effort and the perceived level of performance - on the one hand - and the expectation of reward (its size) - on the other hand" (Hellriegel, 1992, quoted by Mihailescu et al., 2011).

Motivation is the process governing the choices made by each individual athlete to achieve sports performance and fulfills a regulatory function in the athlete's conduct, it is determined by a consciously proposed aim and represents „a state that energizes behavior and gives it direction" (Atkinson & Hilgard, 2005). In the context of the above mentioned, the research was initiated in order to identify the motivational level of high performance rowers in terms of the three motivational factors: valence, expectancy and instrumentality, considered by Mamali (1981) to form „the infrastructural level of motivation".

In professional sports, motivation plays a decisive role because it underlies the continuity of sports training at a level as close as possible to optimal. This should be seen both from the point of view of the athlete, of the professional entourage (coaches, doctors, psychologists, managers, etc.) and of the social entourage (family, friends, etc.).

The approach from the perspective of the individual maintains that the motivating force is inherent to the individual and depends on personal characteristics such as needs, impulses, instincts, personality traits. In the situational perspective (individual + environment), behavior also depends on factors exterior to the individual, such as the working environment, nature of work, management style of superiors, etc. (Cucui & Cucui, 2014).

Human performance, including sports performance, can be explained as a multiplicative factor of motivation and capabilities/skills (Epuran et al., 2008; Gherghişan Bologa & 1994; Mihailescu & Serban, 2005), P = f (MXA). The sources of motivation are internal and external: internal motivation results from maintaining in an active state the needs and interests that evolve and restructure along the path of building the performance capacity; external motivation generated by the environment is felt to a lesser extent by the high competitive value athlete (Mihailescu & Serban, 2005; Nepopaloov & Aleksandridi, 2004; Popa et al., 2006).

Athletic performance can be influenced by the intensity of motivation, as it is known that optimally motivated athletes generally tend to achieve better performance. So, motivation is one of the factors contributing to individual athletic performance; along with motivation, performance is strongly influenced by skills, abilities, biomotor qualities, by the understanding of objectives and by the opportunity to achieve outstanding results (Cucui, 2014).

Hypothesis

We believe that the objective determination of the motivational level generates operational objectives and individual mental preparation strategies, for optimizing the sports performance of rowers.

Material and methods

We mention that in accordance with the Declaration of Helsinki, Amsterdam Protocol and Directive 86/609 / EEC, the approval of the Ethics Commission of the Department of Physical Education and Sports of the „Valahia" University of Targoviste for research on humans was obtained, and also, the consent to personal participation in the research.

Research protocol

a) *Period and place of the research*

The research was conducted in March 2014 at the „Valahia" University of Targoviste. During this period, a set of questionnaires was applied, and the obtained data were collected and processed.

b) *Subjects and groups*

The sample comprised 25 subjects (13 F and 12 M), aged between 19 and 23 years. The subjects were high performance rowers, members of the national team, with medals in national and international sports competitions.

c) *Tests applied*

Depending on motivational factors in Tables I and II, the content of the set of questionnaires was elaborated,

including the three motivational dimensions (valence, expectancy and instrumentality of motivation). The questionnaires were developed and validated by Mihailescu & Serban, 2006 and Haralambie & Mihailescu, 2010.

- Motivational indicators were calculated using the following experimentally validated formulas (Mihailescu & Serban, 2006; Haralambie & Mihailescu, 2010):

- overall motivational force: FMG = V x E; V = valence; E = expectancy.

- motivational instrumentality: IM = V x I; V = valence; I = instrumentality.

d) *Statistical processing*

Processing of data from the questionnaire-based survey was performed using Microsoft Excel.

Results

The infrastructural level of motivation was calculated by determining the size of each dimension of motivation factors, based on which we calculated overall motivational force (FMG) and motivational instrumentality (IM). Quantification was achieved by the indiscriminate use of responses obtained for the intrinsic and extrinsic factors (Tables I, II), according to the Dunnett formula, 1972, validated experimentally by Mihailescu & Serban, 2006; Haralambie & Mihailescu, 2010). The results were assessed on a motivational scale (Fig. 1) with three parameters: large, medium, small, developed based on the scores given to the response options and on the FMG calculation formula (Table III).

The research allowed us to determine/identify the motivational level by quantifying the motivational factor dimension values. Following the centralization of research data and their statistical-mathematical processing, FMG and IM were identified.

Table I

Intrinsic motivational factors.

No.	Motivational items
1.	Content of sports activity: training, competitions, training camps, recovery
2.	Opportunities for the creative use and development of sports abilities
3.	Passion for the sport practiced
4.	Level of sports aspiration: promotion to higher categories, team selections
5.	Self-assertion tendency: integration and hierarchical promotion in the team
6.	Performance need: to be the best, to win, to surpass oneself
7.	Fear of failure, defeat, injuries, opponents, need to feel safe

Table II

Extrinsic motivational factors.

No.	Motivational items
1.	Sports activity norms: laws, statutes, regulations
2.	Material advantages and facilities: bonuses, rewards, housing, travels
3.	Social environment: family, club, public, coaches, media, radio and television
4.	Social prestige of the athlete, practiced sport, club, coach
5.	Management style applied: by the coach, club, administration
6.	Sport-school relationship: the possibility of being an athlete and a student
7.	Material conditions: facilities, equipment, program - schedule

Table III

Score of response options.

		Possible responses		
	Score	3	2	1
Motivational tools	Valence	very important	moderately important	unimportant
	Expectancy	completely corresponds to expectations	sometimes corresponds to expectations	does not correspond at all to expectations
	Instrumentality	totally depends on you	depends on you and others	totally depends on others

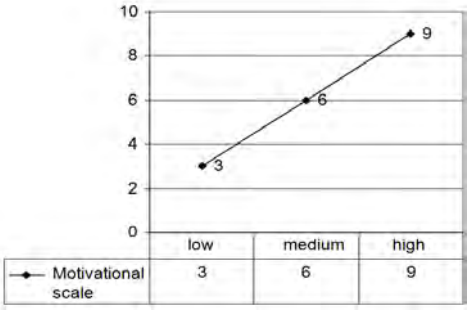

Fig. 1 – Motivational scale.

By processing the questionnaires, the values of the intrinsic and extrinsic indices of the motivation structural elements were determined among high performance rowers; the values of motivational indices are shown in Tables IV-VI (Haralambie, 2010).

Table IV

Values of intrinsic and extrinsic indices of motivational valence.

No. item	No. subjects			No. points			Average answers
	3	2	1	3	2	1	
1	25	-	-	75	-	-	3
2	24	1	-	72	2	-	2.96
3	25	-	-	75	-	-	3
4	25	-	-	75	-	-	3
5	25	-	-	75	-	-	3
6	25	-	-	75	-	-	3
7	16	8	1	48	16	1	2.60
8	17	6	2	51	12	2	2.60
9	23	2	-	69	4	-	2.92
10	10	11	4	30	22	-	2.08
11	21	4	-	63	12	-	3
12	15	7	3	45	21	3	2.76
13	18	6	1	54	12	1	2.68
14	23	2	-	69	4	-	2.92

Table V

Values of intrinsic and extrinsic indices of motivational expectancy.

No. item	No. subjects			No. points			Average answers
	3	2	1	3	2	1	
1	17	8	-	51	16	-	2.68
2	21	4	-	63	8	-	2.84
3	19	5	1	57	10	1	2.72
4	15	7	3	45	14	3	2.48
5	18	5	3	54	10	3	2.68
6	21	4	-	63	8	-	2.84
7	11	13	1	33	26	1	2.40
8	14	10	1	42	20	1	2.52
9	1	9	15	3	18	15	1.44
10	11	12	2	33	24	2	2.36
11	7	14	4	21	28	4	2.12
12	5	18	2	15	36	2	2.12
13	8	16	1	24	32	1	2.28
14	2	11	12	6	22	12	1.60

Table VI
Values of intrinsic and extrinsic indices of motivational instrumentality.

No. item	No. subjects			No. points			Average answers
	3	2	1	3	2	1	
1	1	19	5	3	38	5	1.84
2	3	18	4	9	36	4	1.96
3	10	12	3	30	24	3	2.28
4	12	12	1	36	24	1	2.44
5	7	5	13	21	10	13	1.76
6	16	6	3	48	12	3	2.52
7	17	8	-	51	16	-	2.68
8	-	2	23	-	4	23	1.24
9	-	4	21	-	8	21	1.48
10	5	12	8	15	16	15	1.84
11	3	21	1	9	42	1	2.08
12	2	12	11	6	24	11	1.64
13	14	11	-	42	22	-	2.56
14	-	7	18	-	14	18	1.28

Discussions

After centralizing the data of the questionnaires distributed among high performance rowers, we calculated the infrastructural level of motivation by determining the size of each motivational factor, then we quantified FMG and IM:

FMG = V x E = 6.65;

IM = V x I = 5.55.

The value recorded for FMG indicates a medium level of motivation among high performance rowers.

The analysis and interpretation of the research results show that the investigated subjects attach a particular importance to intrinsic motivational factors such as the content of sports activity, the passion for the practiced sport, self-assertion, the need for performance. It can be seen that the expressed desire to achieve the final goals is consistent with maximizing athletic performance and obtaining social prestige through the sports activity carried out. The results obtained for items 9, 12, 14 evidence that the athletes are aware of the importance of material conditions and of the management style adopted by the coach to optimize sports training, as well as of material benefits obtained from sports performance.

Regarding the subjects' opinion on the likelihood of fulfilling their needs and wishes through the activity practiced, the athletes believe that they are being given the opportunity to use and develop their capacities as expected. The values obtained, 2.68 and 2.84 for items 5, 6, show that the rowers think that through the work carried out they can surpass themselves, they can satisfy their need to be the best and they can assert themselves.

The value (2.52) identified for item 6 of motivational instrumentality indicates that athletes are aware that by achieving the proposed objectives during their sports activity, they can assert themselves on a personal level.

The relatively low result of instrumentality (5.55) is due to the values of the structural elements of motivation, valence and instrumentality, which shows that intervention is required by a specialist (psychologist) in training the rowers. Also, the direct intervention of coaches in collaboration with psychologists can improve performance by optimizing the rowers' psychological training.

Conclusions

1. From the analysis regarding the quantification of FMG, it can be seen that its determination allows us to identify the motivational level of athletes during sports activity.

2. The value recorded for FMG (6.65) indicates a medium level of motivation among high performance rowers, which could be improved by the motivational support provided by coaches and psychologists. The rowers' sports training is supported by their passion for the practiced sport, the desire to win, the need for personal assertion, and by the obtaining of advantages and facilities through the practice of high performance rowing. The analysis highlights that intrinsic motivation leaves its mark on the training of athletes, which also shows the need to maintain and develop intrinsic factors as well as to optimize extrinsic factors.

3. The result for motivational instrumentality (IM=5.55) shows a motivational valence and a motivational instrumentality around a medium level of motivation, which gives the probability of achieving or not the ultimate goals of sports activity.

4. The results regarding the motivational factors reflect the need for the intervention of a specialist in optimizing the mental preparation of rowers to support sports training and the achievement of first level goals, which generates the improvement of sports performance.

5. The knowledge of the motivational level of athletes leads to their training with a view to psychological preparation.

6. The determination of the motivational level of athletes generates motivational strategies to optimize psychological training and maximize sports performance.

Conflicts of interests

Nothing to declare.

Acknowledgments

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Contributions to the psychomotor development of preschool children, through specific kinetoprophylactic exercises
Contribuţii la dezvoltarea psihomotrică a preşcolarului, prin exerciţii specifice kinetoprofilaxiei

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Abstract

Background. The special importance of psychomotor education refers to the whole personality of the child, combining motor and mental elements that may cause the regulation of individual behaviour including participation in various processes of motion that will allow the development of a healthy adult quality of life. Using kinetoprophylaxis as a principal means in primary school insertion and prevention of possible problems that may occur brings additional support to the educational process.

Aims. The aim of the study was the enrichment of kinetic knowledge and kinetic components. In addition, the aim was to facilitate and ensure a favorable school insertion process by improving the psychomotor status of the child.

Methods. The study was conducted on a number of 50 children aged 5-6 years, belonging to Kindergarten "Casa cu Poveşti" Tîrgu Mureş, during October 2013-June 2014. The evaluation was carried out in two stages, an initial one and a final one, using the Portage Motor Scale. After the initial assessment, the subjects were divided into two groups, a control group consisting of 25 children and an experimental group of 25 children showing signs of disturbance and fragility in the psychomotor development process.

Results. The arithmetic mean obtained for the experimental group was 19.84 points on the initial testing and 23.96 points on the final testing, while that of the control group was 22.92 points on the initial testing and 24.44 points on the final testing. The experimental group achieved an improvement of 4.12 points compared to 1.52 points of the control group.

Conclusions. Our study shows that applying kinetoprophylactic activities improved the kinetic knowledge and components of the subjects and thus, their psychomotor status.

Key words: psychomotricity, kinetoprophylaxis, preschool children, education.

Rezumat

Premize. Importanţa deosebită a educaţiei psihomotrice vizează întreaga personalitate a copilului, îmbinând elementele motorii şi psihice ce pot determina reglarea comportamentului individual, incluzând participarea acestuia la diferitele procese de mişcare, care vor permite dezvoltarea calităţii vieţii sănătoase de adult. Aplicarea kinetoprofilaxiei ca mijloc principal în procesul de inserţie şcolară şi prevenţie a posibilelor dificultăţi ce pot să apară aduce un sprijin suplimentar în procesul instructiv-educativ.

Obiective. Obiectivul central al studiului a fost îmbogăţirea bagajului kinetic şi a componentelor kinetice. De asemenea, s-a urmărit facilitarea şi asigurarea procesului de inserţie şcolară favorabilă, prin îmbunătăţirea stării psihomotrice a copilului.

Metode. Studiul a fost realizat pe un număr de 50 copii cu vârstele între 5-6 ani, din Grădiniţa cu Program Prelungit "Casa cu Poveşti" din Tîrgu Mureş, pe perioada octombrie 2013-iunie2014. Evaluarea s-a realizat în două etape, una iniţială şi una finală cu Scala Portage Motor. După evaluarea iniţială, beneficiarii studiului au fost structuraţi în două grupe, un grup control format din 25 de copii şi un grup experiment format din 25 de copii care au prezentat unele semne de perturbări, fragilităţi în procesul de dezvoltare psihomotrică.

Rezultate. Media aritmetică obţinută la testarea iniţială de grupul experiment a fost de 19,84 puncte, iar la testarea finală a fost de 23,96 puncte, iar la grupul control a fost de 22,92 puncte la testarea iniţială, iar la testarea finală a fost de 24,44 puncte. Grupul experiment a obţinut o îmbunătăţire cu 4,12 puncte, faţă de 1,52 puncte a grupului control.

Concluzii. Studiul nostru dovedeşte că prin aplicarea activităţilor kinetoprofilactice s-a îmbunătăţit bagajul şi componentele kinetice ale subiecţilor şi, implicit, starea psihomotrică.

Cuvinte cheie: psihomotricitate, kinetoprofilaxie, preşcolar, educaţie.

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Introduction

The quick and profound transformation of contemporary civilization has brought to the foreground the production of symbolic goods. This transformation is over-mechanized by cybernation and automation, having a social and cultural impact: the transformation of health and education into new industries (Ortan, 2009).

The period we live in is one that brings multiple and rapid changes requiring continuous adaptation since childhood (Vernon, 2004). The growth and psychomotor development of children require special attention to prevent possible anomalies in the education of the new generation. The motor and mental development of the child must begin at birth by influencing the stimuli provided by the family (Albu et al., 2008).

According to Epuran, a human motor activity (2005) "is a body movement that is goal oriented, driven and supported by reasons; some movements and actions are subsumed to the ideal of human self-achievement".

Psychomotor education involves both the child's personality and mental and motor elements. They determine the adjustment of individual behavior including its participation in various motion processes that will enable the development of a healthy adult quality of life (Neagu, 2010). Psychomotricity is considered a very complex act that merges motor skills and mental skills in performing an action. The purpose of motricity extends from obvious motor activities to intellectual and sensory processes (Popovici & Matei, 2005). The specialists approach growth and physical, motor and mental development in all their complexity because all these processes can occur simultaneously (Albu et al., 2008).

The concept of personalized education nowadays is increasingly implemented in public opinion (Muskovits, 2011).

The evolution of psychomotricity is divided into three stages represented by innovation, integration and balance. The period of innovation is the stage in which the preschool child tests his abilities; thus, he accidentally discovers his hand due to an unexpected movement. Later, he tries to repeat the movement to achieve the same effect. The period of integration is characterized by more precise movements due to a better adaptation of nerve control. The preschool child manages to integrate data and express them through a well adapted psychomotor activity. The period of balance is characterized by rest periods alternating with progress periods. The development of the preschool child is a continuous process of transformation and adaptation (Albu & Albu, 1999).

In order to obtain psychomotor development, the following should be taken into account within the implemented programs:

- Motor development that favors motor control, the improvement of motion planes and the acquisition of gross motor skills.
- Personality development to optimize self-confidence, stimulation of communication and self-esteem (Predut-Barbu, 2012).

Human medicine divided into many branches: pediatrics, obstetrics and gynecology, neonatology, etc. aims to re-establish the disturbed equilibrium, which leads to other branches such as kinesiology, aimed at the prevention, education and rehabilitation of the threatened or disturbed balance by the application of movement (Pásztái, 2004).

Sbenghe (2008) says that "in order to accurately define kinesiology, we should say that it is the science of the motion of living organisms and structures which participate in these movements."

Kinetoprophylaxis is part of medical kinesiology; through specific means and methods, it contributes to the maintenance and improvement of the harmonious physical and mental development of the preschool child. Kinetoprophylactic activity through a holistic approach contributes to the progression of the preschool child towards a higher school stage.

The child's growth and development is carefully monitored based on certain principles formulated in this direction, and one of them is that this is a complex process dependent on a harmonious combination of physical, mental, social and emotional development (Cucerea & Simon, 2009).

To strengthen physical and nutrition health that children need, we use what should be the most solid instrument, the link between mental and motor development (de Onis et al., 2006). Motion games help to eliminate mental tensions (Merei & Binet, 2006). These motion games are applied by specialists in psycho-pedagogy, psychology and movement sciences.

Preschool and primary school children are in a continuous search for interaction, which they increasingly want (Hetherington et al., 2006).

Another motion proposal consists of rolling performed by children, which stimulates physical and mental development, because these movements improve their ability to concentrate (Blythe, 2006).

Psychomotricity as a science deals with the study of motor functions integrated and coordinated by mental functions (Albu et al., 2006). A direction of application of psychomotricity includes psychomotor education, psychomotor rehabilitation and psychomotor therapy (Neagu, 2012).

Hypothesis

The implementation of kinetoprophylactic exercises and the applied motion games will improve the psychomotor development of the target group.

Material and methods

We mention that, in agreement with the Declaration of Helsinki, the Amsterdam Protocol and the Directive 86/609/EEC, all study procedures were approved by an ethics commission within the School Centre for Inclusive Education No.2, Tîrgu Mureş, Romania concerning investigation on human subjects, and that we have obtained the written consent of the subjects and of their parents.

Research protocol

a) *Period and place of the research*

The study was carried out at the All-Day Kindergarten "House of Stories" in Tirgu Mures in the period October 2013 - June 2014.

b) *Subjects and groups*

The study subjects were 50 preschool children aged between 5-6 years.

To clearly evidence psychomotor development, an evaluation test, Portage Motor Scale, was applied (Table I).

c) *Tests applied*

Table I
Portage Motor Scale

No.	Items
1.	Balanced walk on a beam: forward, back, lateral.
2.	Hopping.
3.	Swinging, initiating and maintaining the movement.
4.	Loosening the fingers and touching each one with the big toe.
5.	Copying small letters.
6.	Climbing the wooden stairs or the steps of a slide with the length of 3 m
7.	Hammering a nail.
8.	Dribbling the ball with direction.
9.	Coloring 95% inside the contour.
10.	Cutting pictures from magazines, not exceeding 0.5 cm from the outline.
11.	Using the pencil sharpener.
12.	Copying difficult drawings.
13.	Cutting simple shapes from paper.
14.	Folding a square of paper diagonally 2 times in imitation.
15.	Catching a soft ball or a bag of sand with one hand.
16.	Jumping rope alone.
17.	Hitting the ball with a paddle or a stick.
18.	Picking an object while running.
19.	Skating forward about 3 m.
20.	Riding a bicycle.
21.	Sleighing.
22.	Walking or playing in a pool with water not higher than the waist.
23.	Driving a toy vehicle (truck) by pushing it with one foot.
24.	Jumping and spinning on one foot.
25.	Writing one's own name in block letters on a lined sheet.
26.	Jumping from a 30 cm height and landing on feet.
27.	Standing on one leg without support, eyes closed, for 10 seconds.
28.	Hanging from a horizontal bar, supporting one's own weight on arms for 10 seconds.

(Gherguț, 2011)

Portage Motor Scale Score: 1 - achieved; 0.5 - partially achieved; 0 - not achieved.

Quantified key interpretation: - Weak: 0-14 points; - Medium: 15 -19 points; - Advanced: 20 to 28 points.

The subjects were assessed in two stages: initial (I) and final (F).

After the results of the initial evaluation, the study subjects were divided into two groups, a control group (C) consisting of 25 subjects and an experimental group (E) consisting of 25 subjects that showed some signs of disturbance, fragility in psychomotor development.

Group E, in addition to the preschool program, benefited from kinetoprophylactic activities. The activities were divided into five modules, one module/week with a set of various exercises. Kinetoprophylactic activities were carried out in the morning and lasted for 20-30 minutes.

a) *Presentation of the kinetoprophylactic program*

The entire prophylactic program was focused on the acquisition of correct skills, through the stimulation of motor activity and self-image development.

The program was divided into 5 modules, one module/ week. The exercises were diversified and were implemented according to the physical and mental condition of subjects and their preferences. Specific exercises were conducted in the first part of the day and lasted for 10-30 minutes.

b) *Examples of exercises used to develop fine motor skills*

These exercises are particularly important in the formation of fine finger and hand movements. All this leads to a better handling of writing tools, to the avoidance of fatigue and the easy writing on the sheet of paper. The obtained effect is an increase in speed and the adoption of "silent" writing. All exercises should be conducted rhythmically, to develop flowing speech and writing-reading skills.

The exercises for the development of finger and hand muscles were: gripping and grasping the ball, finger tracing of precise contours in a box with sand, positioning the body parallel to the floor and supporting on hands and toes for executing pushups.

The exercises for the development of the small finger and hand muscles were: alternative and rhythmic opening and closing of the fingers; alternative and rhythmic spreading of the fingers and bringing them together; tracing letters in the air with the finger; cutting and coloring letters; rhythmic squeezing of a dynamometer or a rubber ball; writing graphemes using the contour pattern. During the remaining time, children were trained in pair or collective games.

c) *Examples of exercises for the development of the body scheme*

By the prevention and elimination of orientation disorders, the following can be avoided: reversing letters and graphemes; difficulties in connecting graphemes in writing and letters in reading; reading and writing in the mirror. For this, exercises leading to awareness of left-right, top-bottom relationships and for the correction of visual space agnosia are recommended. Exercises for the reinforcement of the body scheme can also be used:

- Exercises for the identification of different parts of the body;
- Exercises for recognizing one's own body segments in the mirror;
- Imitating the movements of different parts of the body;
- Knowledge of a doll body;
- Drawing the human body;
- Finalizing an incomplete drawing;
- Exercises of self-relating to objects in the environment and recognizing right and left segments;
- Building walking orientation skills in compliance with verbal commands;
- Exercises for the correct perception of the position of objects in space by reference;
- Spatial-temporal locations: time of the day, days of the week, etc.

d) *Examples of motion games for the development of the self-image*

Because of physical and mental fatigue, an emotional hypersensitivity and repulsion towards the educational process may develop in preschool children over time.

To overcome these behaviors, the best method is psychotherapy. This is used to eliminate conflicting and frustrating mental states.

The motion activities were carried out with the active participation of classroom teachers.

Examples of motion games:

- Children are seated on the floor in a circle, and they give the ball to each other; the game may be complicated by throwing the ball diagonally.
- Children are standing facing the mirror, with body cream in their palms; they are encouraged to spread the

cream on the mirror with circular movements in the form of waves, from right to left and vice versa.

- Children are seated in a circle and are asked to pass a colorful scarf from one to the other, at a slow rhythm, which is increased after 30 seconds.
- Individual work: preschoolers are taught to juggle a plastic bowling pin, then two pins.
- One-to-one work: throwing (passing) a cushion from one to the other, while counting, starting at a slower rate, increasing the rhythm after 15 seconds.
- Back-to-back, one-to-one work: throwing (passing) a cushion from one to the other, while counting, starting at a slower rate, increasing the rhythm after 15 seconds.
- Children standing in the kindergarten room, pieces of paper are thrown on the floor. Children gather the pieces one by one, first with the left hand, then the game is repeated with the right hand.
- Children in an Indian file, 2 m away from a mini basketball hoop placed at a height of 120 cm, throw the ball into the basket, first with both hands, then with the left hand, and finally, with the right hand.
- Children in an Indian file perform rhythmic walking exercises, on a predetermined distance; at the beginning they are allowed to set their own pace, then the therapist sets the pace.
- Children are positioned on one side of the kindergarten room. On the signal given by the therapist, they will run across the room.

e) *Examples of exercises to strengthen motor control*

- Exercises of spontaneous individual handling of several objects and toys (balls, cubes, dolls);
- Exercises of motor imitation: head movements (bending, rotation); trunk movements (leaning forward, bending, twisting); limb movements (rotation, bending);
- Practicing breathing through the game;
- Exercises to educate the relaxation and inhibition capacity;
- Exercises for strengthening and practicing actual laterality: hand, eye, foot;
- Exercises for practicing psychomotricity and developing the sense of rhythm: walking, running, jumping, rolling.

d) *Statistical processing*

For the statistical analysis of data, we used the SPSS 16.0 statistical calculation program.

Results

The arithmetic mean obtained at the initial testing was 19.84 points for group E and 22.92 for group C.

At the final testing, an arithmetic mean of 23.96 points in group E and 24.44 points in group C was obtained.

Between the I and F testing, there was an improvement of 4.12 points in group E and 1.52 points in group C.

After the initial testing and the assignment of subjects to group E and group C, an average of 19.84 in the experimental group and 22.92 in the control group was obtained. $p=0.001$ so, $p<0.05$, which means that the difference between the two groups was statistically significant.

After the final testing, the experimental group had an average of 23.96 and the control group had an average of 24.44. $p=0.224$ so, $p>0.05$, which means that the difference between the two groups was statistically insignificant.

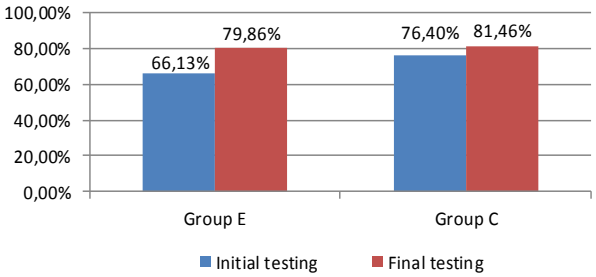

Fig. 1 – Results obtained by the subjects at the initial and final testing.

Discussions

The kinetoprophylactic exercises and motion games implemented in the experimental group were dosed in accordance with the requirements and planning of preschool teaching projects.

The time allocated to the implementation of the kinetoprophylactic program in the experimental group ranged between 20 and 30 minutes, depending on the complexity of work and the stressing level of exercise capacity.

In implementing the kinetoprophylactic program, the level of interest in certain motion games of the experimental group members was taken into account. Throughout the kinetoprophylactic activities, a permanent collaboration with the teachers at the institution where the study was carried out was maintained.

The results obtained following the initial and final evaluations, as well as the kinetoprophylactic program were presented to the parents of the experimental group and control group members by teachers, while complying with confidentiality, which means that the information was transmitted individually.

Following the application of the kinetoprophylactic program, the difference found between the experimental group and the control group at the initial testing was reduced, which was statistically confirmed. The psychomotor development of the experimental group was equal to that of the control group.

Conclusions

1. The implementation of kinetoprophylactic exercises and motion games improved the psychomotor development of the experimental group, which proves that the hypothesis was confirmed.
2. Following the application of the final test to the group of subjects, there was a considerable improvement in the psychomotor development of the experimental group, which demonstrates that our program had the desired effect.
3. We consider the study and monitoring of motor development as necessary, in order to have a healthier generation with a multidimensional valence to ensure the quality of life.

Conflicts of interests

There are no conflicts of interest.

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Aspects regarding the motivation of fencers
Aspecte privind motivaţia sportivilor care practică scrima

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Abstract

Background. Motivation is one of the most important variables in sports practice and a key-element that facilitates both performance and a positive experience.

Aims. The main aim of this study is to determine the dominant type of motivation in fencing athletes (sabre fencing), as well as the type of motivation related with the subjects' gender and age.

Methods. To assess the seven subscales of motivation, we used the Sport Motivation Scale Questionnaire (SMS-28). The study took place in Iasi, at the beginning of September 2014, during the National Junior Fencing Championships. The research sample comprised 69 fencers aged between 12 and 20 years. Depending on age and gender, the subjects were divided into two groups: 12-15 and 16-20 years.

Results. Male athletes obtained lower scores in all three types of intrinsic motivation and higher scores in intrinsic motivation and amotivation, compared to female athletes. The second group, 16-20 years, obtained higher scores for intrinsic motivation (all three types), extrinsic motivation (introjected regulation subscale), and amotivation, compared to the first group.

Conclusions. We found that female fencers are more intrinsically motivated compared to male fencers, and cadets and juniors are more intrinsically motivated than the 12-15 years-old group.

Key words: motivation, fencing, juniors, intrinsic, extrinsic.

Rezumat

Premize. Motivaţia reprezintă una dintre cele mai importante variabile în practicarea sportului şi un element cheie care va facilita nu doar obţinerea performanţei, ci şi o experienţă pozitivă.

Obiective. Obiectivul acestui studiu constă în determinarea tipului de motivaţie care predomină la practicanţii scrimei, respectiv sabie, precum şi analiza tipului de motivaţie în raport cu genul şi vârsta participanţilor.

Metode. Şapte tipuri de motivaţie au fost măsurate cu Scala Motivaţională în Sport (SMS-28). Cercetarea a fost realizată la începutul lunii septembrie 2014, cu ocazia desfăşurării la Iaşi a Campionatelor Naţionale de Scrimă pentru juniori. Lotul de subiecţi a cuprins un număr de 69 de sportivi care practică scrima (sabie), cu vârsta cuprinsă între 12-20 ani. În funcţie de vârstă şi gen, subiecţii au fost împărţiţi în două loturi: 12-15 ani şi 16-20 ani.

Rezultate. Rezultatele au arătat că sportivii au obţinut un scor mai mic la cele trei tipuri de motivaţie intrinsecă şi un scor mai mare la motivaţia extrinsecă şi amotivaţie, comparativ cu sportivele. Subiecţii din lotul 15-20 ani au obţinut un scor mai mare la motivaţia intrinsecă (toate cele trei tipuri), la motivaţia extrinsecă, componenta reglare prin introiecţie, precum şi la amotivaţie.

Concluzii. Rezultatele acestui studiu indică faptul că fetele sunt mai motivate intrinsic comparativ cu băieţii, iar sportivii cadeţi şi juniori mai motivaţi intrinsic comparativ cu cei din lotul 12-15 ani.

Cuvinte cheie: motivaţie, scrimă, juniori, intrinsec, extrinsec.

Introduction

Motivation represents all reasons or mobiles (conscious or not) that determine a person to conduct a certain action or achieve certain goals (***, 2007). For a better understanding, specialists in the field have divided it into intrinsic motivation, extrinsic motivation, and amotivation (Ryan & Deci, 2000). Intrinsic motivation is the form of motivation involved when a person decides to do an activity for personal satisfaction (Deci & Ryan, 1985). Intrinsically motivated individuals engage voluntarily – in a way that involves will and personal control – in activities of their interest (Crăciun, 2008). Vallerand & Ratelle (2002) have proposed the existence of three forms of intrinsic motivation: a) toward knowledge – which involves the pleasure and satisfaction that one experiences when learning new things; b) toward accomplishment – trying to reach new personal objectives; c) toward experiencing stimulation – engaging in order to experience stimulating sensations, fun and excitement. Extrinsic motivation pertains to a situation when an activity is done in order

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to attain some outcome or reward. Deci & Ryan (1985, 1991) identify three types of extrinsic motivation, ordered from the lowest to the highest level of self-determination: a) external regulation (to attain a tangible reward or to avoid a threatening punishment); b) introjection regulation (a partial internalisation of extrinsic motivation, when the individual feels pressure, though it may be self-imposed); c) identified regulation (the individual decides to engage in an action that is not very interesting per se, but is nonetheless important, because it is useful for attaining a valued goal; in other words, in identified regulation, the activity still has extrinsic reasons, but the said activity is internally regulated and self-determined).

Motivation is one of the most important variables in sports practice and a key-element that facilitates both performance and a positive experience (Vallerand, 2004). Previous studies found that women are more motivated to engage in sports, because they have more intrinsic than extrinsic motives (Chantel et al., 1996), while others found that intrinsic and extrinsic motives are equally involved in the practice of any type of sports activity (Ryan et al., 1997). In this connection, Ryan and others demonstrated that different sports entail different motivations. Other studies posit that motivation is also different depending on gender. Both adults and children were found to have different motives (Chantel et al., 1996). In performance athletes, it was found that extrinsic motivation is superior to intrinsic motivation, while female athletes reported higher levels of intrinsic motivation compared to male athletes (Chantel et al., 1996).

Hypothesis

While practicing a certain sport, during sports training, the specificity of the said sport influences balance on the preferred leg. Hence, this paper aims to analyze body balance on the preferred leg in beginners aged between 10 and 13 years - practitioners of gymnastics and fencing – and to pinpoint the differences arising in two different conditions: eyes open and eyes closed.

Material and method

Research protocol

a) *Research period*

The investigation was conducted at the beginning of September 2014, during the National Junior Fencing Championships, which took place in Iaşi. We mention that, in agreement with the Declaration of Helsinki, the Amsterdam Protocol and Directive 86/609/EEC, all study procedures were approved by an ethics commission within the Faculty of Physical Education and Sport concerning investigation on human subjects, and that we obtained the oral consent of trainers and athletes participating in the study.

b) *Subjects*

Our research sample comprised 69 sabre fencers, aged between 12 and 19 years.

c) *Tests*

To assess the seven subscales of motivation, we used the Sport Motivation Scale Questionnaire (SMS-28) (Pelletier et al., 1995):

- intrinsic motivation (IM), with the three components: toward knowledge (IM1); toward accomplishment (IM2), and toward experiencing stimulation (IM3);
- extrinsic motivation (EM), with the three components: external regulation (EM1); introjection regulation (EM2), and identified regulation (EM3);
- amotivation (AM).

d) *Statistical analysis*

For statistical calculations, we used SPSS 20.0 for Windows; we calculated Pearson's correlation, as well as the mean and standard deviation, based on which the t test for independent samples was applied; the equality of variance requirement was met following the application of Levene's test.

Results

Pearson's correlation between the Sport Motivation Scale and age, and Cronbach's coefficient alpha are shown in Table I.

We assessed sex and age differences by using the *t* test for independent samples; Levene's test for the homogeneity of variances had an insignificant value: $p>0.05$. We found that male athletes obtained a lower score in the three types of intrinsic motivation and a higher score in extrinsic motivation and amotivation, compared to female athletes (Table II). Significant differences between genders were recorded for EM1 and EM3 (Table III). Depending on age, the subjects were divided into two groups: the 12-15 year age group (children and future athletes) and the 16-20 year age group (cadets and juniors). The subjects of the first group obtained a higher score for EM1 and EM3 and lower scores for all the other types of motivation (Table IV). For all types of motivation, no statistically significant differences were found between the two age groups (Table V).

Table II

SMS score (mean±SD) for all subjects by genders (male vs. female).

Subjects	IM1	IM2	IM3	EM1	EM2	EM3	AM
male	5.01	4.99	4.97	4.78	4.63	4.45	2.84
N=35	±1.65	±1.39	±1.54	±1.33	±1.32	±1.68	±1.22
female	5.05	5.35	5.08	4.09	4.14	3.14	2.13
N=34	±1.35	±1.25	±1.27	±1.10	±1.38	±1.37	±1.15
Total	5.03	5.17	5.02	4.44	4.39	3.94	2.49
N=69	±1.49	±1.33	±1.40	±1.26	±1.36	±1.61	±1.23

Table I

Pearson's correlation between SMS and age, Cronbach's coefficient alpha.

	IM1	IM2	IM3	EM1	EM2	EM3	AM	Age
IM1	-	0.709**	0.813**	0.666**	0.563**	0.529**	-0.323**	0.081
IM2	-	-	0.710**	0.388**	0.512**	0.368**	-0.446**	0.109
IM3	-	-	-	0.557**	0.488**	0.467**	-0.293*	0.073
EM1	-	-	-	-	0.631**	0.631**	-0.097	-0.078
EM2	-	-	-	-	-	0.659**	-0.123	0.658
EM3	-	-	-	-	-	-	0.078	0.072
AM	-	-	-	-	-	-	-	0.104
Cronbach's alpha	0.739	0.779	0.753	0.755	0.755	0.754	0.890	-

Table III
The *t* test for equality of means male vs. female.

Variables	Levene F	Levene Sign.	Mean diff.	Sign.	*P*
IM1	3.196	0.078	-0.037	0.919	>0.05
IM2	1.126	0.292	-0.360	0.265	>0.05
IM3	1.046	0.310	-0.102	0.766	>0.05
EM1	1.664	0.201	0.690	0.023	<0.05
EM2	0.032	0.859	0.488	0.139	>0.05
EM3	1.180	0.281	1.030	0.007	<0.05
AM	0.019	0.891	0.703	0.017	<0.05

Table IV
SMS score (mean±SD) by age categories.

Age	IM1	IM2	IM3	EM1	EM2	EM3	AM
12-15 N=35	4.91 ±1.60	5.02 ±1.35	4.92 ±1.44	4.54 ±1.34	4.37 ±1.48	3.82 ±1.64	2.37 ±1.11
16-20 N=34	5.15 ±1.39	5.31 ±1.31	5.13 ±1.37	4.34 ±1.19	4.41 ±1.25	4.05 ±1.59	2.62 ±1.34

Table V
The *t* test for equality of means by age categories.

Variables	Levene F	Levene Sign.	Mean diff.	Sign.	*P*
IM1	0.913	0.343	-0.240	0.510	> 0.05
IM2	0.042	0.838	-0.287	0.375	>0.05
IM3	0.091	0.762	-0.204	0.551	>0.05
EM1	0.310	0.580	-0.197	0.552	>0.05
EM2	0.969	0.329	-0.047	0.886	>0.05
EM3	0.002	0.964	-0.230	0.558	>0.05
AM	0.596	0.443	-0.253	0.398	>0.05

Discussions

The main objective of this study was to determine the dominant type of motivation in fencing athletes (sabre fencing), as well as the type of motivation related with the subjects' gender and age. For the two types of motivation (intrinsic and extrinsic), we obtained a moderate to strong positive correlation, while for amotivation, a negative correlation (significant for intrinsic motivation and insignificant for extrinsic motivation) was obtained. Cronbach's coefficient alpha had an internal consistency of 0.80 for the seven items, and between 0.73 and 0.89 for each item. Pelletier et al. (1995), Martens & Webber (2002), Sloan & Wiggins (2001), Beaudoin (2006) reported similar findings.

In the subjects of our study, intrinsic motivation was dominant. We found the highest score for IM2 (toward accomplishment). Female athletes were more intrinsically and less extrinsically motivated compared to male fencers; however, the differences were not statistically significant. Briere et al. (1995) and Pelletiere et al. (1995) found similar results. These results are somewhat different from other studies: male athletes scored higher in all items compared to female athletes (Filho et al., 2010); we found significant differences in EM1 and AM and higher scores for male athletes in all types of motivation (Nunez et al., 2006). We obtained significant differences between genders in two of the three types of extrinsic motivation (EM1 and EM3). For EM1, boys obtained a higher score compared to girls, which means that material reward is an important motive in sports practice.

We did not find significant differences between fencers depending on age. Nonetheless, the 16-20 year age group was more intrinsically motivated in all three variables. At the age of 12-15 years, trainers use rewards to encourage young athletes to practice sport (Lazarevic, 2001), which is also apparent in our study, through the results of extrinsic motivation (EM1).

It is assumed that intrinsic motivation for a target-activity is based on the subjects' interest in a certain activity, due to its interesting and pleasant nature (Vansteenkiste & Deci, 2003). In sport, obtaining sports performance is determined by both internal and external motivational factors. In their turn, these depend on the basic needs of the human being, but also on the action of external, social, and pedagogical factors (Nae, 2010).

We also mention several limitations of our study, which prevented us from approaching other aspects. The subjects belong to different types of clubs (school, governmental, county, and private clubs), and the performance level is age dependent. We remind that the Regulation of the Romanian Fencing Federation stipulates that fencers over 12 years of age can attend junior competitions, while fencers over 13 years can attend all competitions for seniors. Furthermore, girls participated in our study before competition, while boys participated during and after competition. Hence, we were unable to make a comparison between medal-winning athletes (in individual or team events) and the other subjects.

Conclusions

1. In junior fencers, intrinsic motivation is dominant.
2. Girls who attended the National Junior Fencing Championships were more intrinsically and less extrinsically motivated than boys.
3. The 16-20 year age group was more intrinsically motivated than the 12-15 year age group.

Conflicts of interest

Nothing to declare.

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Influence of acute exposure to hypobaric hypoxia and ozone, and of lycopene administration on the tissue oxidant/ antioxidant balance in physical exercise studied in the myocardium

Influenţa expunerii acute la hipoxie hipobară, ozon şi administrării de licopin asupra balanţei tisulare oxidanţi/antioxidanţi în efort fizic studiat în miocard

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Abstract

Background. The antioxidant effects of lycopene, evidenced in vitro and in vivo under pathological conditions, led us to study in an experimental model of complex combined stress (exposure to moderate hypobaric hypoxia and ozone, and physical exercise) the acute changes in the tissue oxidant/antioxidant (O/AO) balance following lycopene supplementation.

Aims. The influence of acute exposure to hypobaric hypoxia and ozone and of lycopene supplementation on tissue redox homeostasis under physical exercise conditions was studied in the myocardium.

Methods. The research was performed in 6 groups of white male Wistar rats: group I - control group, sedentary rats under normoxia conditions; group II - sedentary rats exposed to combined acute stress: hypobaric hypoxia (corresponding to a 2500 m altitude) and O_3; group III - animals exposed to combined acute stress – moderate hypoxia + O_3 – followed by exercise, under normoxia conditions; group IV - sedentary rats under normoxia conditions, with lycopene administration; group V - animals exposed to combined acute stress – moderate hypoxia + O_3 – followed by lycopene administration; group VI - animals exposed to combined acute stress – moderate hypoxia + O_3 – followed by lycopene administration and daily exercise, under normoxia conditions. Exposure was simulated in the hypobaric chamber for 3 days, 20 hours a day, at 2500 m. Groups III and VI were trained daily for 3 days under normoxia conditions, using the swimming test. Groups IV, V and VI received 0.0375 mg/kg body weight lycopene by oral gavage (before exercise for group VI), daily. In order to measure the indicators of the oxidant/ antioxidant (O/AO) balance, tissue samples were collected from the myocardium. On day 3, the following were determined: malondialdehyde (MDA), protein carbonyls (PC), hydrogen donor capacity (HD) and total sulfhydryl (SH) groups.

Results. Our experimental results obtained in animals that were exercise trained for 3 days and subjected to combined acute stress – hypobaric hypoxia and O3 – and lycopene administration, support the favorable effects of lycopene as an effective antioxidant in the myocardium under exercise conditions.

Conclusions. Lycopene administration in animals subjected to combined acute stress – hypobaric hypoxia and O_3 – followed by exercise determines an increase in oxidative stress (OS) on account of MDA and PC in the myocardium, compared to control animals.

Key words: acute exposure, hypobaric hypoxia, ozone, lycopene, oxidant/antioxidant balance, physical exercise, myocardium.

Rezumat

Premize. Efectele antioxidante ale Licopinului, evidenţiate in vitro şi in vivo în condiţii patologice, ne-au determinat să studiem pe un model experimental de stres complex combinat (expunere la hipoxie hipobară moderată, ozon şi efort fizic), modificările acute ale balanţei oxidanţi/ antioxidanţi (O/AO) la nivel tisular, după suplimentare cu Licopin.

Obiective. S-a studiat influenţa postexpunerii acute la hipoxie hipobară, ozon şi suplimentării cu Licopin asupra homeostaziei redox tisulare postefort la nivelul miocardului.

Metode. Cercetările au fost efectuate pe 6 loturi de şobolani albi masculi rasa Wistar: Lotul I - control, sedentari în condiţii de normoxie; Lotul II - animale sedentare, expuse la stres combinat acut - hipoxie hipobară (corespunzător altitudinii 2500 m) şi O_3; Lotul III - animale expuse la un stres acut combinat - hipoxie moderată şi O_3 - urmat de efort, în condiţii de normoxie; Lotul IV - animale sedentare în condiţii de normoxie, cu administrare de Licopin; Lotul V - animale sedentare expuse la stres

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combinat acut - hipoxie hipobară şi O_3 - urmat de administrare de Licopin; Lotul VI– animale expuse la un stres acut combinat - hipoxie moderată şi O_3 - urmat de administrarea de Licopin şi efort zilnic, în condiţii de normoxie. Expunerea simulată s-a făcut la camera hipobarică timp de 3 zile, 20 de ore pe zi la 2500 m. Loturile III şi VI au fost antrenate zilnic timp de 3 zile în condiţii de normoxie, prin proba de înot. La loturile IV, V şi VI s-a administrat zilnic (preefort la lotul VI) Licopin în cantitate de 0,0375 mg/ kg corp, prin gavaj pe cale orală. În vederea determinării indicatorilor balanţei oxidanţi/antioxidanţi (O/ AO) s-au recoltat probe din miocard. În ziua a 3-a s-au determinat: malondialdehida (MDA), proteinele carbonilate (PC), capacitatea donor de hidrogen (DH) şi conţinutul de grupări sulfhidril totale (SH).

Rezultate. Rezultatele noastre obţinute experimental pe animale antrenate la efort fizic timp de 3 zile supuse stresului acut combinat – hipoxie hipobară şi O_3 – şi administrării de Licopin, pledează pentru efectele favorabile ale acestuia ca antioxidant eficient la nivelul miocardului în condiţii de efort.

Concluzii. Administrarea de Licopin la animale supuse unui stres acut combinat – hipoxie hipobară şi O_3, urmat de efort – determină creşterea stresului oxidativ (SO), pe seama MDA şi PC în miocard, faţă de animale martor.

Cuvinte cheie: expunere acută, hipoxia hipobară, ozon, Licopin, balanţa oxidanţi/antioxidanţi, efort fizic, miocard.

Introduction

Hypoxia exposure increases oxidative stress, activates inflammatory cytokines, downregulates ion channels and alters the expression of both pro- and anti-oxidant genes. The results of Singh et al. illustrate the physiological function of nitrite as an eNOS-independent source of NO in the heart, profoundly modulating the oxidative status and cardiac transcriptome during hypoxia (Singh, 2012).

Intermittent hypobaric hypoxia (IHH) and endurance training (ET) are cardioprotective strategies against stress stimuli. Mitochondrial modulation appears to be an important step of the process. Data demonstrates that IHH and ET provide cardiac mitochondria with a more resistant phenotype, although without visible addictive effects, at least under basal conditions. It is suggested that the combination of both strategies, although not additive, results in improved cardiac function (Magelhães, 2013). Moreover, ultrastructural changes in the rat heart tissues depend on the intermittent hypoxia training duration (Rozova, 2012).

Ozone-induced sensitivity to myocardial ischemia-reperfusion injury may be due to promoting levels of oxidative stress as well as inflammatory mediators (Perepu, 2010).

The induced oxidative stress and the alterations in the antioxidant system were normalized by the oral administration of lycopene treatment (Mansour, 2012). A high number of conjugated dienes make lycopene a powerful radical scavenger. Its antioxidant properties are considered to be primarily involved in many beneficial health effects. Pretreatment with tomato extract (1 mg/kg, 2 mg/kg) and vitamin E (50 mg/kg) significantly reduced the malondialdehyde concentration in the heart and significantly lowered the serum AST level in adrenaline treated rats. Myocardial necrosis was significantly prevented by pretreatment. Parvin's results suggest that n-hexane extract of tomato possesses antioxidative properties that may protect the heart against catecholamine induced myocardial infarction (Parvin, 2008). In his studies, Ojha suggested that lycopene possesses significant cardioprotective potential and may serve as an adjunct in the treatment and prophylaxis of myocardial infarction (Ojha, 2013).

Yue observed that the pretreatment of cardiomyocytes with lycopene significantly improved the survival of cardiomyocytes and reduced the extent of apoptosis, and significantly reduced caspase-3 activation. Lycopene may protect against hypoxia/reoxygenation-induced injury by preventing calpain activation (Yue, 2013).

The antioxidant effects of lycopene, evidenced *in vitro* and *in vivo* under pathological conditions, led us to study in an experimental model of complex combined stress (exposure to moderate hypobaric hypoxia and ozone, and physical exercise) the acute changes in the tissue oxidant/antioxidant (O/AO) balance following lycopene supplementation (Ugron et al., 2012a; Ugron et al., 2012b; Simon-Ugron, 2014).

Hypothesis

The influence of acute exposure to hypobaric hypoxia and ozone, and of lycopene supplementation on tissue redox homeostasis under physical exercise conditions was studied in the myocardium.

Material and methods

The research was performed in the experimental laboratory of the Department of Physiology of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca, on 6 groups of white male Wistar rats (n=10 animals/group), with a weight of 280-300 g, maintained under adequate vivarium conditions. The animal protection legislation in force was respected during the experimental studies.

Groups

The groups were divided as follows:

- group I - control group, sedentary rats under normoxia conditions;
- group II - sedentary rats exposed to combined acute stress: hypobaric hypoxia (corresponding to a 2500 m altitude) and O_3;
- group III - animals exposed to combined acute stress – moderate hypoxia + O_3 – followed by exercise, under normoxia conditions;
- group IV - sedentary rats under normoxia conditions, with lycopene administration;
- group V - animals exposed to combined acute stress – moderate hypoxia + O_3 – followed by lycopene administration;
- group VI - animals exposed to combined acute stress – moderate hypoxia + O_3 – followed by lycopene administration and daily exercise, under normoxia conditions.

Normoxia corresponding to the altitude of 363 m, O_2: 20.94%, air pO_2: 117 mmHg;

Methods

a) *Exposure to moderate hypoxia*

Exposure to moderate hypoxia was for 3 days, 20 hours/day, at values of 2500 m, pO_2 – 117 mmHg, 15%, using hypoxic rooms from the Experimental Laboratory of the Departament of Physiology.

b) *Exposure to ozone*

The rats were exposed to ozone for 3 days, 5 min/day, at values of 0.5 ppm, according to EU norms, using an AIR O_3NE Labor apparatus (SC Triox SRL).

c) *Exercise test*

Groups III and VI were trained daily for 3 days under normoxia conditions using the swimming test. The test was performed in a pool with thermostatic water at 23ºC.

d) *Lycopene administration*

Groups IV, V and VI received 0.0375 mg/kg body weight lycopene by oral gavage (before exercise for group VI), daily. Lycopene is a product of Hungaronatura Hungary, imported by SC. Herbavit Srl.

e) *Exploration of the oxidant-antioxidant balance*

Biochemical determinations were performed in the Laboratory for the Study of Oxidative Stress of the Department of Physiology of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca.

In order to determine the indicators of the oxidant/ antioxidant balance, tissue samples were collected from the myocardium of the anesthetized animals. The analyzed time moment was day 3.

The following oxidative stress indicators were measured:

– malondialdehyde (MDA), using the fluorescence dosage method according to Conti (2001); concentration values were expressed in *nmol/mg.*

– protein carbonyls (PC); determination of protein carbonyls according to Reznick (1994); concentration values were expressed in *nmol/mg protein*.

The following antioxidant defense indicators were determined:

– hydrogen donor capacity (HD), dosage method according to Janaszewska (2002); values were expressed as per cent of free radical inhibition *(i%)*;

– sulfhydryl (thiol) group content (SH), determination of SH groups according to Hu (1994); values were expressed in *µmol/mg.*

f) *Statistical analysis* was performed using SPSS 19.0 and Microsoft Excel. The data were introduced in a SPSS v.19 database and analyzed with adequate statistical methods. A univariate statistical analysis was used for the description of the studied groups. Quantitative variables were summarized using means ± standard deviations, 95% confidence intervals for the means. According to the laboratory values, the values for the control group were normal. A bivariate stastistical analysis (Pearson correlation, one-way Anova test and LSD post-hoc test) was used to identify the significant association between the groups and between the indicators of the tissue O/AO balance (MDA, PC, HD and SH), with p set at ≤ 0.05 for analyses.

Results

1. *Comparative statistical analysis of the indicators of the tissue O/AO balance*

The indicators of the tissue O/AO balance were compared between sedentary animals and animals performing physical exercise, under normoxia conditions after hypobaric hypoxia and O_3 exposure, and lycopene administration. The majority of the comparisons were significant (Tables I-IV).

The comparative statistical analysis of the indicators of the tissue O/AO balance between the groups is shown in Tables I-IV, and the comparative statistical analysis of the

Table I

Myocardial MDA (values in nmol/mg)

Group	Mean	Std. deviation	Std. error	95% CI		P values
				Lower limit	Upper limit	
Group I	.05700	.004082	.002041	.05050	.06350	I-II= .009; I-III =.000; I-IV=.000; I-V=.000; I-VI=.000; II-III=.000; II-IV=.000; II-V=.000; II-VI=.000; II-IV=.019; III-V=.039; III-VI=.394; IV-V=.000;IV-VI=.003; V-VI=.194
Group II	.09550	.010344	.005172	.07904	.11196	
Group III	.40375	.007544	.003772	.39175	.41575	
Group IV	.43750	.011733	.005867	.41883	.45617	
Group V	.37450	.037350	.018675	.31507	.43393	
Group VI	.39225	.019085	.009543	.36188	.42262	

Table II

Myocardial PC (values in nmol/mg)

Group	Mean	Std. deviation	Std. error	95% CI		P values
				Lower limit	Upper limit	
Group I	.59650	.052571	.026285	.51285	.68015	I-II= .000; I-III =.000; I-IV=.000; I-V=.000; I-VI=.000; II-III=.000; II-IV=.000; II-V=.000; II-VI=.000; III-IV=.000; III-V=.000; III-VI=.000; IV-V=.000; IV-VI=.073; V-VI=.001
Group II	1.15350	.055073	.027536	1.06587	1.24113	
Group III	2.29675	.054021	.027010	2.21079	2.38271	
Group IV	3.17275	.124385	.062192	2.97483	3.37067	
Group V	3.69925	.211457	.105729	3.36277	4.03573	
Group I	.59650	.052571	.026285	.51285	.68015	

Table III

Myocardial HD (values in i%)

Group	Mean	Std. deviation	Std. error	95% CI		P values
				Lower limit	Upper limit	
Group I	49.47825	1.571569	.785785	46.97753	51.97897	I-II= .429; I-III =.000; I-IV=.000; I-V=.001; I-VI=.259; II-III=.000; II-IV=.000; II-V=.000; II-VI=.724; III-IV=.087; III-V=.278; III-VI=.000; IV-V=.009; IV-VI=.000; V-VI=.000
Group II	50.48475	1.617627	.808814	47.91074	53.05876	
Group III	42.84525	1.532041	.766021	40.40743	45.28307	
Group IV	40.59050	.702760	.351380	39.47225	41.70875	
Group V	44.23875	2.966295	1.483148	39.51871	48.95879	
Group VI	50.93075	1.367058	.683529	48.75545	53.10605	

Table IV
Myocardial SH (values in µmol/mg)

Group	Mean	Std. deviation	Std. error	95% CI		P values
				Lower limit	Upper limit	
Group I	.01875	.002500	.001250	.01477	.02273	I-II= .000; I-III =.020; I-IV=.219;
Group II	.02650	.002380	.001190	.02271	.03029	I-V=.889; I-VI=.137; II-III=.083;
Group III	.02325	.004646	.002323	.01586	.03064	II-IV=.006; II-V=.000; II-VI=.011;
Group IV	.02100	.000816	.000408	.01970	.02230	III-IV=.219; III-V=.015; III-VI=.335;
Group V	.01850	.001291	.000645	.01645	.02055	IV-V=.174; IV-VI=.781; V-VI=.107
Group VI	.02150	.001291	.000645	.01945	.02355	

Table V
Indicators of the myocardial O/AO balance in group I

Group I	Mean	Std. deviation	Std. error	95% CI		P values
				Lower limit	Upper limit	
MDA	.05700	.004082	.002041	.05050	.06350	MDA-PC=.860; MDA-HD=.439;
PC	.59650	.052571	.026285	.51285	.68015	MDA-SH=.804; PC-HD=.149;
HD	49.47825	1.571569	.785785	46.97753	51.97897	PC-SH=.012; HD-SH=.174
SH	.01875	.002500	.001250	.01477	.02273	

Table VI
Indicators of the myocardial O/AO balance in group II

Group II	Mean	Std. deviation	Std. error	95% CI		P values
				Lower limit	Upper limit	
MDA	.09550	.010344	.005172	.07904	.11196	MDA-PC=.156; MDA-HD=.025;
PC	1.15350	.055073	.027536	1.06587	1.24113	MDA-SH=.350; PC-HD=.296;
HD	50.48475	1.617627	.808814	47.91074	53.05876	PC-SH=.199; HD-SH=.467
SH	.02650	.002380	.001190	.02271	.03029	

Table VII
Indicators of the myocardial O/AO balance in group III

Group III	Mean	Std. deviation	Std. error	95% CI		P values
				Lower limit	Upper limit	
MDA	.40375	.007544	.003772	.39175	.41575	MDA-PC=.476; MDA-HD=.150;
PC	2.29675	.054021	.027010	2.21079	2.38271	MDA-SH=.546; PC-HD=.141;
HD	42.84525	1.532041	.766021	40.40743	45.28307	PC-SH=.049; HD-SH=.271
SH	.02325	.004646	.002323	.01586	.03064	

Table VIII
Indicators of the myocardial O/AO balance in group IV

Group IV	Mean	Std. deviation	Std. error	95% CI		P values
				Lower limit	Upper limit	
MDA	.43750	.011733	.005867	.41883	.45617	MDA-PC=.324; MDA-HD=.113;
PC	3.17275	.124385	.062192	2.97483	3.37067	MDA-SH=.200; PC-HD=.082;
HD	40.59050	.702760	.351380	39.47225	41.70875	PC-SH=.675; HD-SH=.502
SH	.02100	.000816	.000408	.01970	.02230	

Table IX
Indicators of the myocardial O/AO balance in group V

Group V	Mean	Std. deviation	Std. error	95% CI		P values
				Lower limit	Upper limit	
MDA	.37450	.037350	.018675	.31507	.43393	MDA-PC=.164; MDA-HD=.909;
PC	3.69925	.211457	.105729	3.36277	4.03573	MDA-SH=.025; PC-HD=.972;
HD	44.23875	2.966295	1.483148	39.51871	48.95879	PC-SH=.306; HD-SH=.850
SH	.01850	.001291	.000645	.01645	.02055	

Table X
Indicators of the myocardial O/AO balance in group VI

Group VI	Mean	Std. deviation	Std. error	95% CI		P values
				Lower limit	Upper limit	
MDA	.39225	.019085	.009543	.36188	.42262	MDA-PC=.143; MDA-HD=.197;
PC	3.34750	.180371	.090185	3.06049	3.63451	MDA-SH=.195; PC-HD=.096;
HD	50.93075	1.367058	.683529	48.75545	53.10605	PC-SH=.543; HD-SH=.705
SH	.02150	.001291	.000645	.01945	.02355	

indicators of the tissue O/AO balance in the same group is shown in Tables V-X.

a) *Comparative statistical analysis of the indicators of the myocardial O/AO balance between the groups*

The comparative statistical analysis of the indicators of the myocardial O/AO balance in the studied groups is shown in Tables I-IV.

b) *Analysis of the correlation between the indicators of the myocardial O/AO balance*

The analysis of the correlation between the indicators of the myocardial O/AO balance in the studied groups and significance are shown in Tables V-X.

The analysis of the correlations between the indicators of the tissue O/AO balance evidences significant correlations in the myocardium: in sedentary animals, between PC and SH, group I (Table V), in animals exposed to hypoxia and O_3, between MDA and HD, group II (Table VI), in animals exposed to hypoxia and O_3 followed by physical exercise,

between PC and SH, group III (Table VII), as well as in animals exposed to hypoxia and O_3 followed by lycopene supplementation, between MDA and SH, group V (Table IX);

2. *A comparative analysis of the indicators of the tissue O/AO balance*

In the myocardium of animals acutely exposed to moderate hypoxia and O_3, with lycopene administration (group V) or lycopene administration followed by exercise (group VI), a significant increase in OS on account of PC and an insignificant increase in AO defense on account of SH were found compared to the groups exposed to the same conditions, without lycopene administration (groups II and III). In animals acutely exposed to moderate hypoxia and O_3, with lycopene administration followed by exercise (group VI), a significant decrease in OS on account of PC and changes in AO defense with a significant increase in HD were found compared to animals acutely exposed to moderate hypoxia and O_3, with lycopene administration (group V).

Discussion

Acute exposure to hypobaric hypoxia and O_3 followed by lycopene administration (group V), compared to acute exposure to hypobaric hypoxia and O_3 (group II), determines a significant decrease of MDA and HD and a significant increase of PC and SH in the myocardium.

The association of acute exposure to hypobaric hypoxia and O_3 with lycopene administration followed by exercise (group VI), compared to acute exposure to hypobaric hypoxia and O_3 followed by exercise (group III), determines a significant increase of PC and HD in the myocardium.

Acute exposure to moderate hypoxia and O_3, with lycopene administration followed by exercise (group VI), compared to acute exposure to hypobaric hypoxia and O_3 followed by lycopene administration (group V), determines a significant decrease of PC and a significant increase of HD in the myocardium.

Our experimental results obtained in animals that were exercise trained for 3 days and subjected to combined acute stress – hypobaric hypoxia and O_3 – and lycopene administration, on which we found no literature studies, support the favorable effects of lycopene as an effective antioxidant in the myocardium under exercise conditions.

The AO effects of lycopene can be associated with hypoxic preconditioning and with the protective effects of O_3.

Conclusions

1. Lycopene administration in sedentary animals subjected to combined acute stress – hypobaric hypoxia and O_3 – determines an increase in OS on account of MDA and PC in the myocardium, compared to control animals.

2. Lycopene administration in sedentary animals subjected to combined acute stress – hypobaric hypoxia and O_3 – determines a decrease in AO defense on account of HD in the myocardium, compared to control animals.

3. Lycopene administration in animals subjected to combined acute stress – hypobaric hypoxia and O_3 – followed by exercise determines an increase in OS on account of MDA and PC in the myocardium, compared to control animals.

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Preliminary study for the implementation of the ”Servo-Volley Platform” innovative technology in view of improving the volleyball serve

Studiu preliminar privind implementarea tehnologiei inovative „Platforma Servo-Volley” în vederea perfecţionării serviciului în volei

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Abstract

Background. The use of a modern innovative technology conceived by us and denominated *Servo-Volley* may determine a new approach to specific training that targets the performance objectives and increases team effectiveness while increasing the efficiency of the volleyball serve.

Aims. To prove the efficiency of the innovative platform denominated *Servo-Volle*y during the training of the serve, including in official contests.

Methods. The research was conducted between 2012 and 2013 and included 10 senior players of the CSU Medicina team in Târgu Mures. The research tested the motor skills of the subjects and recorded the efficiency of the serve during the official contests in the preliminary tournament, after implementing the specialized program using the Servo-Volley Platform.

Results. Considering the average efficiency for each area (Z), the research revealed that the areas behind the 2nd line recorded higher values compared to the other areas of the court: 86% in Z5, 84% in Z1 and 82% in Z6. In the center of the volleyball court, the efficiency of each area was as follows: 53% in Z9, 47% in Z7 and 45% in Z8. The lowest efficiency was recorded in the area next to the net, namely in the 1st line, therefore the efficiency in Z2 was 11%, similar to the one in Z4, whereas in Z3, only 5 of the 100 hits were recorded, achieving an efficiency percentage of 5%. During the official contests, the efficiency recorded increased by 18% after the implementation of the program using the *Servo-Volley* platform.

Conclusions. The use of the innovative technology objectified in the *Servo-Volley* platform contributes to the improvement of the serve both during the training and the competition process.

Key words: volleyball, serve, *Servo-Volley* platform, innovative technology.

Rezumat

Premize. Utilizarea unei tehnologii moderne inovative conceputa de noi, denumită *Servo-Volley*, poate determina o nouă abordare a pregătiri specifice, care să urmărească obiectivele de performanţă şi să crească eficienţa echipei, prin creşterea randamentului loviturii de serviciu în volei.

Obiective. Demonstrarea eficienţei utilizării platformei inovative *Servo-Volley* în cadrul procesului de pregătire a serviciului, implicit în cadrul competiţiilor oficiale.

Metode. Cercetarea s-a desfăşurat în perioada 2012-2013 şi a cuprins 10 jucătoare senioare ale echipei CSU Medicina Tirgu Mureş. Probele cercetării au vizat un test motric si inregistrarea efcienţei serviciului în cadrul jocurilor oficiale din turul preliminar, ulterior implementării programului specializat, care utilizează platforma Servo-Volei.

Rezultate. Luând în considerare eficienţa medie pe zone (Z) se observă că zonele din spatele liniei a II-a au înregistrat valori superioare, comparativ cu celelalte zone ale terenului: 86 % în Z5, 84% în Z1 şi de 82% în Z6. La mijlocul terenului eficienţa pe zone a fost următoarea: 53% în Z9, 47% în Z7 şi de 45 % în Z8. Cea mai scăzută eficienţă s-a înregistrat în zona de lângă fileu şi anume în linia I-a, astfel în Z2 au fost 11% la fel ca şi Z4, iar în zona Z3 s-au realizat 5 lovituri din cele 100, realizându-se doar un procent de 5% eficienţă. În ceea ce priveşte eficienţa în cadrul jocurilor oficiale, aceasta a crescut cu 18%, după aplicarea programului care utilizează platforma *Servo-Volley*.

Concluzii. Folosirea tehnologiei inovative concretizată în platforma *Servo-Volley* contribuie la optimizarea serviciului, atât în procesul de pregătire, cât şi în cel competiţional.

Cuvinte cheie: volei, serviciu, platforma *Servo-Volley*, tehnologie inovativă.

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Introduction

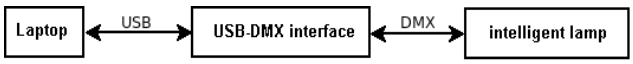
As a novelty of this research, to enrich and diversify the ways of improving the serve hit at senior level, a platform called *Servo-Volley* was conceived, which allows, through visual stimulation, the demarcation of a circular space in a specific area in which the serve hit is practiced.

The *Servo-Volley* platform is equipped, in addition to the rotating head device code PHS 710 that generates the light beam, with a specifically designed software that once installed in a computer, allows the coach to select a clearly delineated area where the beam will be projected and towards which the service will be conducted.

The device is placed on a stand at the level of the sports hall ceiling.

From a technological point of view, the system is made up of a hardware component and of control software. The hardware component consists of commercial equipment, easy to purchase on the market: an intelligent high-power (moving head) stage lamp FutureLight PHS 710, a USB-DMX interface EntTec USB PRO 512, a laptop with Windows operating system, and the wiring needed to interconnect the components.

The software is an application made in the programming language C#, running on the laptop and providing the user with a graphical control interface, and performing communication and thus control through the USB-DMX interface with the intelligent lamp.



Between the laptop and the USB-DMX EntTec interface, communication is carried out with the specific EntTec protocol through a virtual serial channel developed by the Windows driver, while between the interface and the intelligent lamp, communication is achieved with the standard DMX protocol.

Compared to the other ways of improving the serve hit, the innovative platform allows to practice and improve this hit both in a single delineated sub-area and by changing the sub-areas from one execution to another, which may increase the adaptability and responsiveness to changing game conditions.

The software attached to the *Servo-Volley* platform is conceived as follows: the court is divided into nine areas of 3/3 metres each which, in turn, can be divided into nine smaller areas of 1 sq.m. each, which are called sub-areas.

As the platform control is manually achieved from the computer, the coach is able to select the sub-areas that require to be worked on and to vary these sub-areas in different areas.

The visual stimulation of the volleyball players in order to improve the execution of the serve hit in a certain sub-area offers new opportunities to practice, correct and improve the technical execution as well as to increase individual efficiency.

The implementation of modern information technology in high performance sports allows the analysis of the players' performance, which determines the improvement of training, and implicitly, the efficiency of their performance in the training and competition process.

The current research on the analysis of volleyball matches focuses on the importance of team success and failure (Drikos et al., 2009).

Several studies are mainly focused on analyzing the sets associated with the variables of service, reception and attack (Palao et al., 2005; Amasay, 2008; Afonso & Mesquita, 2011; Castro et al., 2011).

Researchers have tried to find explanations in an attempt to identify the significant factors for high performance sports and particularly, how they relate to the increase of effectiveness, given the complex and dynamic nature of the match (Marcelino et al. 2011).

Getting points within the volleyball game at the higher sample level with a minimum of effort but high technical skills is the prerogative of the serve hit.

Success in sports is mostly influenced by how athletes prepare for the competition. High performance in volleyball is characterized by an equilibrium between the various complex actions and the game phases (Palao & Valadés, 2014).

Executing a serve hit with great technical skills may cause difficulty for the opponents and even if the first execution does not bring a point, it can lead to carrying out an effective attack since the taking over calls for a more careful mobilization under hampered conditions. Service efficiency is dependent on several physical, psycho-motor and technical factors (Horička et al., 2014; Grgantov et al., 2013).

Improving service has been a permanent concern for professionals, and technological innovation contributes to the optimization of the serve training process in volleyball.

Combining the *Servo-Volley* platform use in the training process with the data provided by the *Data-Volley Software* contributes to the optimization of the serve training process.

Match analysis, with an emphasis on team sports performance, has aroused the interest of many professionals and researchers who have aimed to identify the variables that best define the team and player training process (Hughes & Franks, 2004; Ortega et al., 2009; Shearer et al., 2007), due to the need to better understand the environment that promotes success in sports (Medeiros et al., 2014).

By introducing computer technology and specialized software for data collection, analysis and processing, a general overview as well as a particular player-focused image of the specific mathematical situation can be obtained during the volleyball game, which helps coaches in making the most appropriate decisions.

At the same time, if practicing new means of action or using a technological innovation regarding the improvement of a certain technical and tactical action is desired, innovative technologies and software allow to process and analyze the effects of these new ways of approach to training, during specific periods of time.

Regarding the specific field of the volleyball game, specialists in this and related areas are trying to develop innovative materials and equipment in order to facilitate the improvement of a certain individual technical action.

In volleyball, both the observation and the analysis of the game enable researchers to identify a great diversity of technical procedures in various situational contexts (Silva, 2013).

Nevill et al. (2008) reported that match analysis is an

important means to acquire profound knowledge of sports competition, being in this way an essential element of the coach's intervention throughout the training process in selecting the factors that lead to performance improvement and therefore, to success in sports (Martin et al., 2004; Marcelino et al., 2011).

Sports games are characterized by the variety and complexity of the technical and tactical situations and also, by the actions of the partners and opponents, requiring a continuous adaptation and efficiency of the entire motor behavior of the players (Badau et al., 2011).

Innovations in the fields related to high performance sports aim to increase individual and team performance by improving technical and tactical actions and by enhancing the spectacularity of performance, being in accordance with the trends and the evolution level of the volleyball game.

Hypothesis

In establishing the general hypothesis, we started from the assumption that the technical and efficiency level of the service actions specific to a volleyball game can be improved through the development and application of a specialized training program, through the use of an innovative platform called *Servo-Volley*, which also determines an increased efficiency during official matches.

Material and methods

We mention that according to the Helsinki Declaration, the Amsterdam Protocol and Directive 86/609/EEC, the approval of the Ethics Commission of the Department of Physical Education and Sports of the University of Medicine and Pharmacy Târgu-Mureş regarding research on human subjects was obtained and also, the subjects' consent for their personal participation in the research.

Research protocol

a) *Period and place of the research*

The training was conducted in accordance with the evolution during the game and the performance goals. In order to highlight the efficiency of the *Servo-Volley* platform use in the serve training process, the research was extended and a comparison was made between the team efficiency in the 2012-2013 championship return and in the 2013-2014 championship round.

Preliminary research was carried out as follows:

- Division A National Championship return 15.12.2012 - 27.02.2013, using the software attached to the statistics program called DataVolley;
- implementing the specialized serve training program by using the *Servo-Volley* platform 09.08 - 10.10.2013;
- motor testing - 25.09 - 10.10.2013;
- Division A National Championship round 12.10.2013 - 20.12.2013, using the software attached to the statistics program called DataVolley.

The location of the training and testing process using the *Servo-Volley* platform was the "Dr. Pongracz Anton" Sports Hall of the University of Medicine and Pharmacy of Târgu-Mureş.

b) *Subjects and groups*

The population sample subjected to the research consisted of 10 senior female players, with an average age of X±SDage=21.3±0.8, members of the CSU Medicina Tg. Mureş team.

c) *Tests applied*

The preliminary experimental research involves the study of certain parameters regarding the accuracy and efficiency of the service actions that will be subsequently monitored in the dynamics of the official matches of the senior players of the CSU Medicina Târgu-Mureş team, using the *Servo-Volley* platform for training and processing of the data provided by the *Data-Volley* software.

The software is unique, created for this project; it displays on the graphical interface the model of the sports court divided into 9x9 squares, and when selecting a square, it automatically places the beam light of the intelligent lamp on the equivalent square on the sports court. The application also provides light beam color changing that can be used for particular significances during training.

This research includes both *the independent variable*, which is a factor created by the experimenter and consists of a training program using the *Servo-Volley* platform in order to improve the service and to increase the execution precision in the directions of attack and their effectiveness, and *the dependent variable*, which is a factor modified by the independent variable after applying the experimental model developed.

The results of the preliminary research reveal that the game actions specific to the game structure no. I require improvements in technique and efficiency among all players, since these are defective.

The team's weekly training program was the following: 2:2:1:2:2:1; on Mondays, Tuesdays, Thursdays and Fridays there were two training sessions, while on Wednesdays and Saturdays there was only one training session. In order to improve their service, the players trained once a week, on Tuesdays, attending the morning training program for 120 minutes. After physical training, in the fundamental training part, only the specifically designed program using exclusively the *Servo-Volley* platform was applied and practiced.

The description of the serve training program was as follows:

- week 1-2 – training duration: once/week/120 minutes for specialized serve training in areas Z1 and Z5 – number of individual executions: 45 executions in each area (9 sub-areas x 5 executions);
- week 3-4 – training duration: once/week/120 minutes for specialized serve training in areas Z1, Z6, Z5 – number of individual executions: 30 executions in each area (9 sub-areas x 5 executions);
- week 5-6 – training duration: once/week/120 minutes for specialized serve training in areas Z1, Z9, Z8, Z7, Z5, Z6 – number of individual executions: 18 executions in each area (2 executions /sub-area/area);
- week 7-8 – training duration: once/week/120 minutes for specialized serve training in all areas Z1-Z9 – number of individual executions: 10 executions in each area

In order to improve the serve hit, considering the *Servo-Volley* platform conceived by us, the court was divided into nine areas of 3/3 metres each, which in turn were divided into nine sub-areas of 1/1 metres each.

Due to the intelligent lamp equipped with four different colored lights, by connecting to the computer software specific to the platform, changes in color depending on brightness in the hall or on the coach's option, as well as changes in the

radius diameter of the circle projected on the court areas or sub-areas can be performed. Thus, the volleyball court will have 9 areas and 81 sub-areas. This organization was made because the light beam has a range of about one meter under maximum beam brightness conditions.

In Fig. 1 we present the volleyball court graphics as it appears on the laptop monitor/software attached to the platform.

Fig. 1 – Areas and sub-areas according to the *Servo-Volley* platform software.

In this study, the evaluation included a motor test and a comparison of the serve efficiency during the official matches in the return prior to applying the experimental program and in the round subsequent to applying this program.

The motor test consisted of the execution of 10 float serve hits (S) or jump serve hits (SQ): for each area, the players performed 10 hits each in the opponents' court in the area chosen by the coach, which was lighted using the intelligent lights of the *Servo-Volley* platform (the lighted area was a circle with the radius of 1 sq.m.). The balls entering the lighted circle were considered valid points and were noted with + (plus), while the missed balls, i.e. the balls that did not enter the lighted circle, were noted with – (minus). After recording all the hits in each of the nine areas, efficiency was calculated using the following formula specific to the Data-Volley program:

efficiency % = successful executions / total number of executions x 100

This test was applied at the end of the preliminary research period, after the implementation of the specific program regarding the improvement of the serve hit using the innovative platform called *Servo-Volley*.

d) *Statistical processing*

For the statistical processing of the research data, we used the Data-Volley software and the SPPS program.

Results

Table I presents the centralized results for each of the nine areas of 3/3 m each, individually for each of the 10 team players.

For a better visualization of the results achieved by the players with regard to the serve hit efficiency in the court areas, a comparative graphical representation was made (Fig. 2).

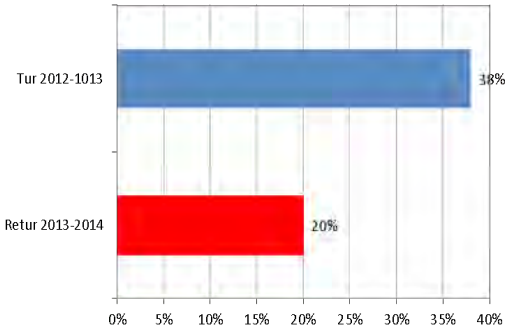


Fig. 2 – Comparative graphical representation of efficiency for the 2012-2013 championship return and the 2013-2014 championship round.

Discussions

In the motor test, the players achieved an average efficiency by areas of 47.11%.

By analyzing the results of the average efficiency, it can be noted that the highest rates were obtained by MC no. 12, playing as a main striker, with 53.33%, as well as TA no. 9, playing as a second striker (area 4).

The most inefficient were IF no. 8, playing as a striker, with an efficiency percentage of only 43.33%, preceded by FG no. 15, playing as a second striker in area 4, with 44.44%.

Out of the 10 players attending this test, 8 had an efficiency rate below 50%.

After the execution of 10 serve hits in a 3/3 m area (which is rather easy for the division A performance level), applied at the end of the specific training period, using the innovative Servo-Volley platform, the following results were recorded:

- in this test the players achieved an average efficiency by areas of 47.11%;
- by analyzing the results of the average efficiency, it

Table I

Serve - final test - 10 float (S) or jump (SQ) serve executions in each area.

Subjects	Area 1			Area 2			Area 3			Area 4			Area 5			Area 6			Area 7			Area 8			Area 9			X
	+	-	%	+	-	%	+	-	%	+	-	%	+	-	%	+	-	%	+	-	%	+	-	%	+	-	%	%
SA	7	3	70	2	8	20	1	9	10	1	9	10	9	1	90	9	1	90	4	6	40	4	6	40	5	5	50	46.67
CL	9	1	90	1	9	10	1	9	10	0	10	0	8	2	80	9	1	90	6	4	60	5	5	50	5	5	50	48.89
IR	8	2	80	0	10	0	0	10	0	1	9	10	10	0	100	8	2	80	5	5	50	5	5	50	4	6	40	45.56
IF	9	1	90	1	9	10	0	10	0	2	8	20	7	3	70	8	2	80	3	7	30	3	7	30	6	4	60	43.33
TA	10	0	100	2	8	20	1	9	10	1	9	10	9	1	90	7	3	70	6	4	60	6	4	60	6	4	60	53.33
GV	8	2	80	0	10	0	0	10	0	1	9	10	10	0	100	8	2	80	5	5	50	5	5	50	4	6	40	45.56
PA	9	1	90	1	9	10	0	10	0	2	8	20	7	3	70	8	2	80	3	7	30	3	7	30	6	4	60	43.33
MC	10	0	100	2	8	20	1	9	10	1	9	10	9	1	90	7	3	70	6	4	60	6	4	60	6	4	60	53.33
TG	7	3	70	2	8	20	1	9	10	1	9	10	9	1	90	9	1	90	4	6	40	4	6	40	5	5	50	46.67
FG	7	3	70	0	10	0	0	10	0	1	9	10	8	2	80	9	1	90	5	5	50	4	6	40	6	4	60	44.44
TOTAL	84	16	84	11	89	11	5	95	5	11	89	11	86	14	86	82	18	82	47	53	47	45	55	45	53	47	53	47.11

can be noted that the highest rates were obtained by MC no. 12, playing as a main striker, with 53.33%, as well as TA no. 9, playing as a second striker in area Z4;

- the most inefficient were IF no. 8, playing as a striker, with an efficiency percentage of only 43.33%, preceded by FG no. 15, playing as a second striker in area 4, with 44.44%;

- out of the 10 players attending this test, 8 had an efficiency rate below 50%;

- the players who had the highest efficiency in this test executed float serve hits in a controlled manner, with a high precision index and a reduced strength index;

- taking into account the average efficiency by areas, it can be noted that 2nd line areas recorded higher values compared to other court areas: 86% in Z5, 84% in Z1 and 82% in Z6;

- in the middle of the court, efficiency by areas was the following: 53% in Z9, 47% in Z7 and 45% in Z8;

- the lowest efficiency was recorded in the area next to the net, namely in the 1st line; thus, in Z2 as well as in Z4, there was an 11% efficiency, while in Z3, only 5 of the 100 hits were executed, with the achievement of only 5% efficiency.

The 2012-2013 Division A National Championship return comprised 9 matches for the C.S.U. Medicina Tg. Mureş team, where the average efficiency recorded was 20% out of a total number of 726 serves, while in the round, there were 11 matches with a total number of 845 serves, the efficiency recorded being 38%.

Conclusions

1. The implementation of the training program using the Servo-Volley platform resulted in an 18% increase of efficiency between the 2012-2013 return and the 2013-2014 round of the official matches.

2. Taking into account the average efficiency by areas, it can be noted that the areas behind the 2nd line recorded higher values compared to other court areas: 86% in Z5, 84% in Z1 and 82% in Z6. In the middle of the court, efficiency by areas was the following: 53% in Z9, 47% in Z7 and 45% in Z8.

3. The lowest efficiency was recorded in the area next to the net, namely in the 1st line; thus, in Z2 as well as in Z4, there was an 11% efficiency, while in Z3, only 5 of the 100 hits were executed, with the achievement of only 5% efficiency.

4. Efficiency is satisfactory given that we worked in 3/3 metre areas, which at senior level is rather easy. In order to achieve the desired efficiency, it is necessary that the serve hit training should be conducted in a continuously reducing area.

Conflicts of interests

There are no conflicts of interest.

Acknowledgments

The article highlights partial results of the preliminary study for implementing the innovative platform called Servo-Volley conceived by Ramona Ungur.

This paper is based on the preliminary research data of the first author's doctoral thesis, submitted to the Transilvania University of Braşov.

The research on the use of the Servo-Volley platform for the improvement of service, in addition to the relevance of the results obtained, also materialized in registering and obtaining from OSIM (The State Office for Inventions and Trademarks) the invention patent number A/00231/2014 on behalf of Ramona Ungur.

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CASE STUDIES
STUDII DE CAZ

Vertebral fracture - the first clinical sign of osteoporosis – Case report

Fractura vertebrală, prima manifestare clinică a osteoporozei – Prezentare de caz

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Abstract

Background. Osteoporosis is the most frequent metabolic bone disease characterized by: reduction of bone mass, alteration of bone architecture, deterioration of bone quality, and increase of fracture risk. The frequency of osteoporotic vertebral fractures reported by the literature varies between 33-85%; of these, only 25-33% evidence a clinical manifestation when they occur. Regardless of the bone mineral density value, the presence of a vertebral fracture increases the risk of other vertebral fractures by 5 times, the risk of hip fractures by 1.8 times, and the risk of non-vertebral fractures by 1.6 times.

Aims. The purpose of this study was to assess a vertebral fracture as the first clinical sign of osteoporosis, and to distinguish predisposing factors for this disease complication.

Methods. The case report brings into discussion a patient in whom a vertebral fracture was the first clinical manifestation of osteoporosis.

Patient LP, aged 57 years, presented to our service in April 2013 for marked pain in the dorsolumbar spine, with onset 3 weeks before. Of the patient's personal history and living conditions, we mention the onset of menopause at the age of 39 years, and smoking for the last 25 years, 20 cigarettes/day.

The objective examination of the patient at the time of presentation: BMI=23 kg/m², spontaneous pain at the percussion and mobilization of the dorsolumbar spine, without dural or neurological signs. Dorsolumbar spine X-ray, vertebral CT and the measurement of bone mineral density using the method of dual X-ray absorptiometry allowed us to make a positive diagnosis and to initiate adequate antiosteoporotic treatment. Any change in the shape, size, contour or structure of a vertebral body should be interpreted in a clinical context. The majority of osteoporotic fractures are located in the thoracic or thoracolumbar region; an osteoporotic fracture above T7 is unusual and the suspicion of malignancy should be eliminated.

Results. After 2 weeks of treatment (strontium ranelate 2 g/day, calcium 1000 mg/day and vitamin D3 1000 UI/day), we obtained an important improvement of symptomatology, and 4 weeks after the initiation of treatment, the patient resumed most of her daily activities.

Conclusions. An adequate oral treatment for osteoporosis, in combination with specific kinesitherapy, can reduce the pain and increase the mobility of the patient.

Key words: osteoporosis, vertebral fracture.

Rezumat

Premize. Osteoporoza este cea mai frecventă boală metabolică osoasă caracterizată prin: reducerea masei osoase, alterarea arhitecturii osoase, deteriorarea calităţii osului şi creşterea riscului de fractură. Frecvenţa fracturilor vertebrale osteoporotice variază în literatură între 33-85%; dintre acestea doar 25-33% au manifestare clinică în momentul producerii. Indiferent de valoarea densităţii mineral osoase, prezenţa unei fracturi vertebrale creşte de 5 ori riscul de apariţie al altora la nivel vertebral, de 1,8 ori riscul de apariţie a fracturii de şold şi de 1,6 ori riscul de apariţie a unei fracturi non-vertebrale.

Obiective. Obiectivul acestui studiu este reprezentat de monitorizarea unei fracturi vertebrale, ca primă manifestare clinică a osteoporozei, şi de evidenţiere a factorilor de risc pentru această complicaţie a bolii.

Metode. Prezentarea de caz aduce în discuţie cazul unei paciente, în care fractura vertebrală a fost prima manifestare clinică a osteoporozei.

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Pacienta, în vârstă de 57 ani s-a prezentat în serviciul nostru, în luna aprilie 2013 pentru o durere accentuată la nivelul coloanei dorso-lombare, cu debut de aproximativ 3 săptămâni. Dintre antecedentele personale şi condiţiile de viaţă ale pacientei, menţionăm instalarea menopauzei la 39 de ani, la o pacientă fumătoare de aproximativ 25 ani, 20 ţigări/zi.

Examenul obiectiv al pacientei în momentul prezentării: IMC=23Kg/m², durere spontană, la percuţia şi la mobilizarea coloanei vertebrale dorso-lombare, fără semne durale sau neurologice. Radiografia de coloană dorso-lombară, examinarea computer tomograf la nivel vertebral şi determinarea densităţii mineral osoase prin metoda absorţiometriei bifotonice cu raze X au stabilit diagnosticul pozitiv şi ne-au permis iniţierea unui tratament adecvat antiosteoporotic. Orice modificare de formă, dimensiune, contur şi structură ale unui corp vertebral, trebuie interpretată în context clinic. Majoritatea fracturilor osteoporotice sunt localizate în regiunea toracală sau toraco-lombară; o fractură osteoporotică deasupra T7 este neobişnuită şi trebuie eliminată suspiciunea de malignitate.

Rezultate. După 2 săptămâni de tratament (ranelat de stronţiu 2g/zi, calciu 1000 mg/zi şi vitamina D3 1000 UI/zi) am obţinut ameliorarea importantă a simptomatologiei, iar la 4 săptămâni după iniţierea tratamentului pacienta şi-a reluat majoritatea activităţilor zilnice.

Concluzii. Tratamentul adecvat antiosteoporotic în combinaţie cu kinetoterapia specifică a ameliorat semnificativ durerea şi mobilitatea acestei paciente.

Cuvinte cheie: osteoporoză, fractură vertebrală.

Introduction

The World Health Organization (WHO) defines osteoporosis as a systemic disease of the skeleton, characterized by the reduction of bone mass and the deterioration of bone tissue microarchitecture, with a consecutive increase of bone fragility and fracture risk.

Bone mass reaches the highest level around the age of 26-30 years, and the normal bone mass loss rate is about 2% per year. In postmenopausal women, bone loss is accelerated, being approximately 4% per year, causing in this way the disappearance of 25-30% of the skeletal mass in 5-10 years. In the same time period, men lose approximately 12% of their bone mass. 60-80% of the bone mass is genetically determined, the rest of 20-40% being attributed to nutrition, physical exercise, medication, lifestyle (Jie et al., 2013).

WHO considers osteoporosis as one of the major diseases of the modern era, estimating that in the next 25 years, the number of osteoporosis cases will increase three times. Thus, osteoporosis and the fractures it causes are a major health problem for society and must be given priority attention (Briggs et al., 2007).

Vertebral fractures are found in approximately one third of women aged over 65 years, their incidence and prevalence being two times higher in women than in men (Khan et al., 2014).

The incidence of fractures that complicate osteoporosis increases with age. Thus, 97.2% of femoral neck fractures are found in subjects aged over 50 years; for these fractures, mortality in the first year is 12-24% (Păun, 1999).

The major clinical consequence of osteoporosis remains fracture, which occurs following a minor trauma or in its absence, which is why these fractures are termed insufficiency fractures. The most common osteoporotic fracture sites are trabecular bone rich areas. The proportion of trabecular bone is different depending on the considered areas: lumbar vertebrae 75%, calcaneus 70%, proximal femur 50-70%, distal radius 25% (Pongchaiyakul et al., 2005).

The frequency of osteoporotic vertebral fractures reported by the literature varies between 33-85%; of these, only 25-33% evidence a clinical manifestation when they occur. Regardless of the bone mineral density (BMD) value, the presence of a vertebral fracture increases the risk of other vertebral fractures by 5 times, the risk of hip fractures by 1.8 times, and the risk of non-vertebral fractures by 1.6 times (Lunt et al., 2002).

Radiologically, osteoporotic vertebral fractures induce changes in the shape, size, contour and structure of the vertebral body: concave vertebral endplate(s); lack of parallelism between the lines of the vertebral endplate, reduction of height compared to other vertebrae; reduction of anterior height compared to posterior height; a horizontal vertebral angle; a concave anterior margin of the vertebral body; opacities below the vertebral endplate given either by the compression of bone trabeculae or by the formation of callus (they are found particularly in central fractures in which the external margin remains intact); interrupted but not destroyed vertebral endplates (differential diagnosis with fractures secondary to metastases, primary tumors, myeloma); a step appearance; loss of vertical continuity with the adjacent vertebra (Mughal, 2002).

The majority of osteoporotic vertebral fractures are located in the thoracic or thoracolumbar region; any fracture situated above the thoracic vertebra 7 is unusual and should be suspected of malignancy. The most frequently affected vertebrae are D12 and L1, followed in decreasing order by the adjacent dorsal and lumbar vertebrae (Topini et al., 2014).

Vertebral compression is of several types: sometimes compression is predominantly anterior (Fig. 1), the vertebral body acquiring a trapezoid or cuneiform appearance. Cuneiform vertebrae situated in the dorsal region cause kyphosis in that segment of the spine. Sometimes compression is uniform, the vertebral body having a rectangular appearance from the side (collapsed vertebra). In the lumbar region, osteoporosis translates into a cupuliform deformation of vertebral endplates, which are depressed under the pressure transmitted by the discs, leading to a concave or biconcave appearance of the vertebra, depending on whether one or both endplates are affected (Fig. 1, Fig. 2, Fig. 3a, 3b, 3c, 3d) (Korkmaz et al., 2014).

Compression osteoporotic fracture of L2 with a height reduction of 55% in the anterior and middle region and 25% in the posterior region.

Fig. 1 – Wedge osteoporotic fracture of T12 with a height reduction of 30% in the anterior region and 20% in the middle region.

Fig. 2 – Compression osteoporotic fracture of L3 with a height reduction of about 40%.

Initially, the fracture appears as a small central depression that increases with time. At 6 months, around the collapsed area, an osteosclerotic line is found. At one year, the fracture is consolidated through a dense osteosclerosis line.

Dual-energy X-ray absorptiometry (DEXA) is the gold standard, with a performance equaled only by incomparably more expensive methods such as quantitative computed tomography (QCT). In the absence of DEXA, the diagnosis of osteoporosis according to WHO criteria cannot be established.

Vertebral compression falsely increases the measured bone mineral density; the greater the compression, the higher the bone mineral density, due to the reduction of the vertebral projection area (Fig. 4a, 4b) (Topini et al., 2014).

Fig. 4a – Lumbar spine X-ray (LL)

Fig. 4b – Lumbar spine - DEXA

Fig. 4 – Vertebral compression of L3. Falsely increased BMD at the level of this vertebra.

Hypothesis

We assessed an osteoporotic vertebral fracture in a 57-year-old female patient, without clinical signs of osteoporosis, as an example for clinical management.

Material and methods

The study was performed in accordance with all current deontological rules. The approval of the Ethics Committee of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca and the patient informed consent were obtained.

Research protocol

Period and place of the research

This is the case of a patient, female, aged 57 years, who presented to the Clinical Rehabilitation Hospital in April 2013, complaining of very intense pain in the dorsolumbar spine, with onset 3 weeks before, following a trunk movement.

Subjects and groups

Of the patient's physiological and pathological personal history and living conditions, we mention menarche at the age of 14 years, the onset of menopause at the age of 39 years, and smoking for the last 25 years, 20 cigarettes/day.

The general objective and locomotor system examination at the time of presentation evidenced a normal

Fig. 3a – Dec 2011 Fig. 3b – May 2012 Fig. 3c – Dec 2012 Fig. 3d – CT Dec 2012

Fig. 3 – Compression fracture of L2 during evolution. Lateral lumbar X-ray.

weight patient with a BMI = 25.5 kg/m² (weight 63 kg, height 1.57 m), spontaneous pain at the percussion and mobilization of the dorsolumbar spine, without dural or neurological signs. The patient had no associated disorders and was not under observation for any chronic disease.

Tests applied

Dorsolumbar spine X-ray showed an increased transparency of the rachis and the compression of about 60% of the dorsal vertebra 8 (Fig. 5a, 5b), which was subsequently confirmed by vertebral CT (Fig. 6).

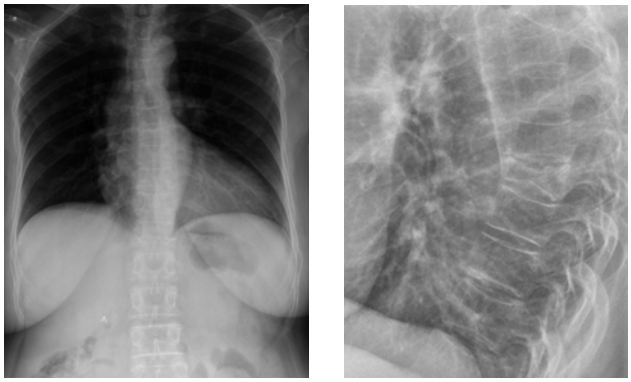

Fig. 5a – Dorsal spine X-ray (AP) Fig. 5b – Dorsal spine X-ray (LL)

Fig. 5 – Dorsal spine X-ray (AP, LL).

Fig. 6 – Vertebral CT.

The measurement of bone mineral density using DEXA evidenced low T score values (number of BMD standard deviations compared to the peak value of a young subject), particularly at vertebral level (Fig. 7).

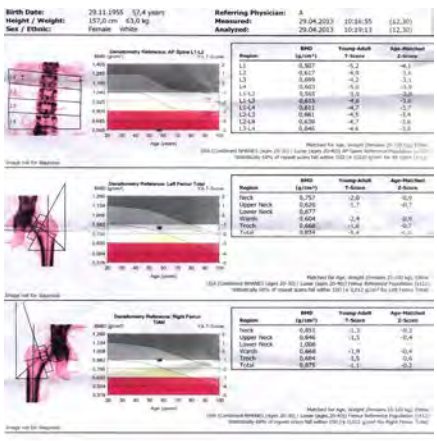

Fig. 7 – BMD (DEXA) at vertebral and bilateral femoral level.

Results and discussions

Based on clinical and paraclinical data, the diagnosis of type I primary osteoporosis (postmenopausal/presenile) with a 60% compression of the D8 vertebral body was made, and treatment with strontium ranelate 2 g/day, calcium 1000 mg/day and vitamin D3 1000 UI/day was initiated.

Strontium ranelate has a different action mechanism compared to other antiosteoporotic drug treatments, enhancing bone formation and at the same time, reducing resorption (Reginster et al., 2008; Reginster et al., 2012; Reginster et al., 2009; Meunier et al., 2004).

After 2 weeks of treatment, symptomatology was significantly improved, the patient resumed domestic activities and started a kinesitherapy program, which included exercises for the toning of paravertebral muscles and exercises in a gravitational field, in orthostatism (Giangregorio et al., 2014). Active exercises, including exercises against external resistances were performed, the relation of proportionality between the BMD of a bone segment and the muscle strength of adjacent muscles attached to that bone segment being demonstrated. Exercising the body through activities carried out against gravity (walking, low-intensity running, climbing stairs, dancing, skiing, aerobic exercises, treadmill, stepper, cycling exercises) will prevent or correct BMD loss, particularly in spongy bone (Murtezani et al., 2014; Mihailov & Cevei, 2006).

Studies demonstrate a change in T score and bone markers (osteocalcin, alkaline phosphatase) after approximately 12 weeks of regular moderate physical exercise performed 3 times/week (Ahmad et al., 2014).

Particularity of the case

Brutal symptoms with pain and the important limitation of function in a patient that was not previously diagnosed with osteoporosis, on the background of a vertebral fracture - about 60% compression of the D8 vertebral body, with a favorable evolution shortly after the initiation of antiosteoporotic drug treatment.

Conclusions

1. Vertebral fracture can be the first clinical sign of osteoporosis.
2. Our study demonstrates that adequate anti-osteoporotic drug treatment and specific kinesiterapy ameliorates pain and mobility in patients with osteoporotic vertebral fractures.
3. The rehabilitation program prevents short-term and long-term complications.

Conflicts of interests

There are no conflicts of interest.

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REVIEWS
ARTICOLE DE SINTEZĂ

Athletes and the cardiovascular system
Afectarea cardiovasculară la sportivi

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Abstract
The cardiac changes of athletes in response to systematic conditioning are somewhat variable, with some degree of cardiac remodeling in approximately one-half of trained athletes. A variety of cardiovascular diseases represent the most common causes of sudden death in young athletes. The vast majority of these deaths in athletes younger than 35 years of age are due to several congenital or acquired cardiac malformations. Hypertrophic cardiomyopathy is the single most common cause of athlete deaths (responsible for approximately one third of the cases), followed by congenital coronary artery anomalies. The vast majority of deaths in middle-aged athletes are due to unsuspected atherosclerotic coronary artery disease.

Recently, recommendations of the European Society of Cardiology (ESC) and the International Olympic Committee (IOC) have triggered a new debate regarding the most appropriate strategy for screening trained athletes and other sports participants.

Key words: cardiovascular system, athletes, sudden death

Rezumat
Modificările cardiace la sportivi, ca răspuns la condiţionarea sistemică, sunt variabile, iar la aproximativ o jumătate dintre aceştia, este întâlnit un anumit grad de remodelare cardiacă. Cele mai frecvente cauze de moarte subită la tinerii sportivi sunt reprezentate de o varietate de boli cardiovasculare. Majoritatea acestor decese la sportivii sub 35 de ani sunt cauzate de anomalii cardiace congenitale sau dobândite. Cardiomiopatia hipertrofică este cauza cea mai frecventă a deceselor la sportivi (responsabilă pentru aproximativ o treime din cazuri), urmată de anomalii coronariene congenitale. Majoritatea deceselor la sportivii de vârstă medie se datorează bolii aterosclerotice coronariene nediagnosticate.

Recent, Societatea Europeană de Cardiologie (ESC) şi Comitetul Olimpic Internaţional (CIO) au dezbătut cea mai potrivită strategie privind screeningul cardiovascular al sportivilor.

Cuvinte cheie: sistem cardiovascular, sportivi, moarte subită.

Introduction

Physical exercise plays an important role in the primary and secondary prevention of cardiovascular diseases, reducing the effect of risk factors (arterial hypertension, diabetes mellitus, dyslipidemia, obesity) (Chandra et al., 2013; Cordero et al., 2014; Brinker et al., 2014). However, paradoxically, high performance athletes have a higher risk of exercise-induced sudden cardiac death (Lawless et al., 2014). The term athlete refers to persons who train for more than six months, more than six hours a week (Carre, 2012). The first who noted that the heart of trained athletes differed from that of the general population was Henschen in 1899 (Weiner & Baggish, 2012). Based on auscultation and percussion, he found that skiers had increased cardiac cavity dimensions. The clinical observations made in 1899 were proved only in 1950 using chest radiography (Pelliccia et al., 2012). With the development of ultrasound, cardiac remodeling in athletes could be better studied.

The constant, intense practice of a sport for a prolonged time period may induce adaptive clinical, electrical and morphological changes in the cardiovascular system, known as "athlete's heart" (Carre, 2012). Cardiac changes in athletes in response to systemic conditioning are variable, and a certain degree of cardiac remodeling is found in approximately half of these (Pelliccia et al., 2012). Dynamic, endurance aerobic isotonic exercise leads to a chronic volume overload, which results in an increase of

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left ventricular mass in parallel to left ventricular diameter, and cardiac remodeling through eccentric hypertrophy develops. In contrast, strength anaerobic isometric exercise increases pressure, resulting in concentric hypertrophy, through the increase of parietal thickness, without the dilation of cardiac cavities (Cordero et al., 2014; Lawless et al., 2014; Weiner & Baggish, 2012; Pelliccia et al., 2012; Ginghină, 2010). Cardiovascular changes associated with athlete's heart include: the increase of parietal thickness and biventricular cavity dimensions, the increase of the left atrial cavity size (and volume), associated with normal or supranormal systolic and diastolic ventricular function (Cabanolas, 2013; Bonow et al., 2012; Apor et al., 2013; Griffet et al., 2013); however, a mild systolic dysfunction was found to occur in 11% of cyclists (Lawless et al., 2014). These changes are most frequently reversible after short deconditioning periods (4-6 weeks up to 3 months), but there is evidence that cardiac remodeling is not completely reversible even after many years of deconditioning, which raises the suspicion that prolonged training may induce permanent myocardial impairment (Ginghină, 2010; Bonow et al., 2012; Luthi et al., 2008; Baldesberger et al., 2008).

Competition preparticipation screening

Screening recommendations for athletes differ depending on the country, sport, and competition level, and are mainly aimed at detecting cardiac diseases with a risk for sudden death (La Gerche et al., 2013). In 1982, the first screening program for athletes, compulsory from 12 to 35 years, with re-evaluation every 2 years, including anamnesis, objective examination and ECG, was implemented in Italy. This program proved to be highly effective, decreasing mortality among athletes by 90% (Dougherthy et al., 2013; Myerson et al., 2012). In USA, the screening program became compulsory only starting with 2007 (according to AHA), and it only comprises anamnesis and objective examination, without ECG (Myerson et al., 2012; Grazioli et al., 2014). In Japan, a screening program was implemented in 1973, with the identification of athletes at risk, these measures proving to be effective for the decrease of morbidity/mortality in time (Nistiuchi et al., 2014). In 2004, ESC (European Society of Cardiology) and the International Olympic Committee decided to include ECG in the screening of athletes (Myerson et al., 2012).

Causes of sudden death in athletes

Sudden cardiac death (SCD) is the main cause of death in athletes and occurs within an hour from the onset of symptomatology (Dougherthy et al., 2013; Leikin et al., 2013). The incidence of sudden death in young athletes aged less than 35 years is 0.4 per 100,000/year (Italy), between 2.3-4.4/100,000/year (USA), and is 10 times more frequent in men (Chandra et al., 2013; Cordero et al., 2014; La Gerche et al., 2013; Dougherthy et al., 2013; Demorest, 2013). Only 30% of athletes with SCD have a positive family history (Leikin et al., 2013). The most frequent causes of sudden death in young athletes in USA are: hypertrophic cardiomyopathy, coronary anomalies, RV arrhythmogenic dysplasia, myocarditis, channelopathies, frequently through the ventricular arrhythmias that they induce. In Italy, the most common cause of sudden cardiac death is RV arrhythmogenic dysplasia (Grubb et al., 2012). In USA, these deaths are more frequently found in basketball and football, sports with the highest participation levels, which involve intense physical activity. Athletes aged over 35 years have a different demographic profile, with a more frequent participation in individual sports such as the marathon, and in 80% of them, sudden death is secondary to undiagnosed coronary ischemic disease (Heidbuchel et al., 2012; Massoure et al., 2014). This is why a preparticipation screening program is extremely important, in order to detect potential cardiovascular diseases with an increased risk of sudden death, to provide treatment, and sometimes to recommend the cessation of high performance sports activity.

ECG changes in athletes

Electrocardiographic changes are present in 60% of athletes, being more frequent in men (10 times more frequent) and in athletes who practice endurance sports (Williams et al., 2012; Brosnan et al., 2014; Drezner & Ackerman, 2013). The majority of cardiovascular diseases can be suspected based on ECG changes. In February 2012, a group of experts in sports cardiology set up the ECG criteria allowing for a differential diagnosis between normal ECG in athletes and ECG changes requiring additional investigations for the detection of underlying cardiovascular disorders. These are found in the literature as the Seattle ECG criteria (Drezner & Ackerman, 2013). Due to regular training > 4 hours/week, ECG changes occur, which reflect the benign structural and electrical remodeling of the heart, secondary to the increase of vagal tone and cardiac cavity dimensions (Drezner & Fischbach, 2013). According to the Seattle criteria, these *physiological* changes are: *sinus bradycardia* (a ventricular rate between 30 and 60 beats per minute; it occurs in 80% of athletes), *sinus arrhythmia* (in 55% of athletes, more frequently in young athletes), *atrial or junctional rhythm, first degree AVB* (PR > 200 ms) and *Mobitz 1 AVB II* (benign if disappearing during exercise), *incomplete RBBB* (in 40% of athletes), *early repolarization syndrome; left ventricular hypertrophy* only based on increased QRS voltage criteria (Sokolow Lyon index) (Drezner & Ackerman, 2013; Drezner & Fischbach, 2013). In athletes of Afro-American origin, early repolarization changes are frequently found, with convex ST segment elevation (in two thirds of athletes), with J point elevation, followed by negative T waves in the anterior territory (25%) (Drezner & Fischbach, 2013; Noseworthy & Baggish, 2013; Muramoto et al., 2013; Pagourelios et al., 2011).

ECG changes considered to be *pathological* in athletes according to the Seattle criteria are: T wave inversion, ST segment depression, pathological Q waves, bundle branch blocks, left or right axial deviation, left atrial or right ventricular hypertrophy, ventricular preexcitation syndrome, long QT syndrome (>470 ms in men, >480 ms in women) or short QT syndrome (<340 ms), Brugada like early repolarization, sinus bradycardia <30/minute or sinus pause >3 seconds, ventricular extrasystoles >2 in 10 seconds, supraventricular or ventricular tachyarrhythmia

(Drezner & Ackerman, 2013; Drezner & Fischbach, 2013; Erz et al., 2013).

Structural cardiac diseases associated with SCD

Hypertrophic cardiomyopathy (HCM) is the most frequent cause of sudden cardiac death in USA, occurring in approximately one third of athletes, and in UK in 11% of athletes. In current practice, this pathology frequently poses problems of differential diagnosis with changes specific for athlete's heart, which occurs as benign cardiac remodeling during exercise. HCM is an asymmetrical ventricular hypertrophy (with a parietal thickness > 15 mm), with a small LV (frequently less than 45 mm), dilated left atrium, with diastolic dysfunction (due to microvascular dysfunction that frequently leads to ischemia), with altered LV geometry (affected mitral valve), with left ventricular ejection obstruction, being found in approximately 25% of athletes (Pelliccia et al., 2012; La Gerche et al., 2013; Leikin et al., 2013; Drezner & Ashley, 2013). Contrast MRI can detect myocardial fibrosis areas, which underlie subsequent ventricular arrhythmias (La Gerche et al., 2013). ECG is pathological in approximately 90% of athletes with HCM. Anomalies include LVH accompanied by T wave inversion in the infero-lateral territory, ST segment depression, pathological Q, LBBB, left axial deviation, left atrial dilation (Drezner & Ashley, 2013). Risk factors for SCD are: syncope, decrease of blood pressure during exercise, a positive family history, LV parietal thickness > 30 mm, sustained or non-sustained ventricular arrhythmia, which requires the implantation of a prophylactic intracardiac defibrillator (Demorest, 2013). A possible variant of HCM is solitary papillary muscle hypertrophy (Panduranga et al., 2013).

Right ventricular arrhythmogenic dysplasia (RVAD). In Italy, a quarter of autopsied sudden deaths were of right ventricular arrhythmogenic dysplasia etiology (Drezner & Ashley, 2013). The presence of this disease increases 5 times the risk of exercise-induced sudden death (Chandra et al., 2013; James et al., 2013). It consists of the replacement of myocardial tissue with steatofibrous deposits, which cause RV dilation and dysfunction, with the formation of aneurysms, with an increased risk of ventricular arrhythmia and SCD (Chandra et al., 2013; Demorest, 2013; Heidbuchel et al., 2012; Williams et al., 2012; Drezner & Ashley, 2013). Only in 50% of the cases, it is associated with specific desmosomal mutations (Drezner & Ashley, 2013). In 10% of the cases, it can manifest only in the left ventricle (Drezner & Ashley, 2013). ECG is abnormal only in 80% of the cases, with the presence of the following: negative V1-V4 T waves with an isoelectric ST segment, epsilon waves, microvoltage in the limb leads, ventricular extrasystoles with a LBBB appearance (Chandra et al., 2013; Drezner & Ashley, 2013).

Recently, the hypothesis has been advanced that prolonged physical exercise may cause, due to cardiac remodeling that is more important in the right ventricle, RV dilation and dysfunction, with a proarrhythmogenic effect (in one third of athletes). Thus, a new syndrome has been described: *exercise-induced RV arrhythmogenic cardiomyopathy*, which occurs in athletes and is pathogenetically similar to RVAD. This syndrome is more common in cyclists (80%) (Heidbuchel et al., 2012; James et al., 2013; Steriotis et al., 2013; D'Andreea et al., 2013).

Coronary anomalies are the second most frequent cause of SCD in USA (12-33%), the first most frequent cause being left coronary artery arising from the right coronary ostium (Chandra et al., 2013; Demorest, 2013; Massoure et al., 2014; Guenarcia et al., 2013; Kaski et al., 2013). Coronary flow decreases during exercise due to: an abnormal ostium, compression of coronary arteries between the great vessels, coronary spasm. Only a third of the affected subjects have preceding symptoms (angina, syncope, dyspnea) (Trahan et al., 2014). Rest ECG is normal, but the exercise test is negative in 20% of them. This pathology favors the development of early ischemia and ventricular arrhythmia (Chandra et al., 2013; Demorest, 2013; Massoure et al., 2014; Trahan et al., 2014; Tan et al., 2014).

Left ventricular non-compaction is a rare cause of SCD in athletes < 1%. The myocardium appears trabeculated, with a risk of thrombus and embolism formation. ECG changes that may occur are: repolarization, long QT, ST segment depression, negative T, LVH, LBBB or RBBB (Drezner & Ashley, 2013; Gati et al., 2013).

Another cause of SCD in athletes is *commotio cordis* (20% in USA), more common in children and adolescents, due to increased thoracic compliance, particularly in baseball, lacrosse, hockey, softball players. It is a precordial contusion, which occurs 10-30 ms before the T wave peak (in the vulnerable repolarization period), with the induction of ventricular fibrillation. This syndrome is described with an increasing frequency in the literature, and 60% of the affected subjects successfully respond to resuscitation procedures (Chandra et al., 2013; Leikin et al., 2013; Demorest, 2013; Link, 2014).

Electrical anomalies associated with SCD

Long QT syndrome in athletes has the following diagnostic criteria: QTc >470 ms in men and >480 ms in women; it is a hereditary disease, with a prevalence of 1:2000-5000. Thirteen mutations affecting potassium channels have been described. LQT1 syndrome is most frequently associated with exercise-induced SCD, particularly in swimmers and divers, due to adrenergic discharge induced by immersion in cold water (2-4%). It predisposes to the development of monomorphic or polymorphic ventricular tachycardia (1,20, 21, 44). *Short QT syndrome* (<340 ms) is less common; it also favors the development of ventricular arrhythmia, due to accelerated repolarization (Chandra et al., 2013; Drezner JA et al., 2013).

Brugada syndrome is another hereditary channelopathy, through the impairment of natrium channels. ECG shows an atypical ST segment elevation in the right precordial leads (pseudo-RBBB), accompanied by negative or biphasic T waves. It predisposes to ventricular arrhythmia particularly during rest and sleep, but it can also follow exercise, due to exercise-induced hyperthermia; it can be identified using class I anti-arrhythmic drugs (Chandra et al., 2013; Williams E et al, 2012; Drezner JA et al., 2013).

Wolf-Parkinson-White syndrome is a ventricular preexcitation syndrome with anterograde conduction,

through an accessory atrioventricular pathway. Associated ECG changes are: short PR (<120 ms), wide QRS (>120 ms) and delta wave. The association of this syndrome with atrial fibrillation has an increased risk of ventricular arrhythmia and SCD, through rapid conduction through the accessory pathway (1:1000 prevalence, occurring in 1% of athletes) (Chandra et al., 2013; Demorest R, 2013; Drezner JA et al., 2013).

Catecholaminergic polymorphic ventricular tachycardia (CPVT) is a hereditary disease, exercise-induced ventricular ectopia, with a 1:10,000 prevalence in the general population. Rest ECG is normal, but the exercise test may evidence multifocal ventricular extrasystoles, ventricular tachycardia or ventricular fibrillation (Chandra et al., 2013; Drezner & Ackerman & Cannon, 2013).

Ventricular extrasystoles are frequent in high performance athletes (physiological), but they can be the expression of hidden cardiac disorders and require cardiological evaluation. Ventricular extrasystoles with a LBBB appearance, more than two in 10 seconds (by Holter monitoring > 2000/24 hours), have an increased risk of inducing malignant arrhythmia. In endurance athletes, these have been associated with a higher risk of exercise-induced RV arrhythmogenic cardiopathy (Drezner & Ackerman & Cannon, 2013; Lampert, 2012).

High performance sport is frequently forbidden to athletes with severe cardiovascular disorders. Thus, athletes with *ischemic heart disease* with a negative prognosis, i.e. those with severe ventricular dysfunction, inducible ischemia or electrical instability, hemodynamically significant stenosis over 50%, can practice only low intensity sports activities and require self-training for stopping the effort when symptomatology occurs (Bonow et al., 2012; Thompson et al., 2005). Athletes with recently revascularized myocardial infarction can resume sports activity after 4 weeks (Thompson et al., 2005). Athletes with severe, symptomatic *valvular regurgitation/stenosis*, with important pulmonary hypertension, cannot participate in sports competitions. Athletes under *oral anticoagulant* treatment should avoid contact sports and sports with a high risk of hemorrhage (Bonow et al., 2012; Bonow & Cheitlin, 2005). The presence of *HCM, RVAD, myocarditis, DCM, coronary anomalies* predisposes to an increased risk of SCD, participation in sport competitions being forbidden (Bonow et al., 2012). Athletes with *Marfan syndrome* with an increased risk, i.e. aorta > 40 mm, moderate or severe mitral insufficiency, a positive family history for SCD, have an increased risk of aortic dissection, particularly during weight lifting, and should give up competitive sport (Bonow et al., 2012). *Congenital cardiac malformations* contraindicate high performance sport if uncorrected, cyanogenic, symptomatic, with severe pulmonary hypertension, accompanied by tachy- or bradyarrhythmia, myocardial dysfunction. If these malformations have been surgically corrected, sport can be resumed after 2-4 months, and if they have been solved interventionally, participation in competitions is possible after 3-6 weeks, in the absence of other contraindications (Graham et al., 2005). *Cardiac rhythm and conduction disorders* cause 1% of SCD in athletes and are frequently symptomatic. Chronic tachyarrhythmia may induce cardiac remodeling, and exercise-induced transient tachyarrhythmia can cause injuries to the athlete. Athletes with arrhythmias require re-evaluation every 6-12 months. After interventional treatment through ablation, athletes can resume sports activity in days. Athletes with preexcitation syndrome can resume sports activity 2-4 weeks after the ablation treatment of the accessory pathway (Zipes et al., 2005). Athletes diagnosed with *channelopathies* (long or short QT, Brugada syndrome, CPVT) have an increased risk of exercise-induced SCD, intense physical exercise being prohibited at least until the implantation of an intracardiac defibrillator (Zipes et al., 2005).

Conclusions

1. Athlete's heart is a structural, morphological and electrical alteration, in response to sustained physical exercise. These changes are physiological and should be known by the treating doctor, in order to be adequately interpreted. Athlete's heart frequently poses problems of electrocardiographic and echocardiographic differential diagnosis with some channelopathies, cardiomyopathies or other cardiovascular disorders.

2. A clear delineation between physiological and pathological changes in athletes is mandatory in order to avoid the prohibition of sport in healthy athletes and also, to prohibit it in cases with a high risk of sudden death. This is why a sports cardiology subspecialty has lately been developed, and ECG, echocardiographic criteria have been established in order to differentiate between pathological and physiological changes.

3. In the majority of the cases, the presence of cardiovascular disorders contraindicates high performance sport, particularly of high intensity, at least until their pharmacological, interventional or surgical treatment.

Conflicts of interest

Nothing to declare.

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Senescence – a determinant or contributory cause of increasing the risk of falling? (Note II)

Senescenţa - factor determinant sau cauză favorizantă pentru creşterea riscului de cădere? (Nota II)

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Abstract

Age-related changes in gait are defined by: reduced peak hip extension, increased anterior pelvic tilt, an increase in peak external hip flexion moment in stance, a reduction in knee flexion moment in preswing, reduction in knee power absorption in preswing, reduced ankle plantar flexion and ankle power generation.

Older persons with a high risk of falls had significantly longer response and transfer times than the young group. Errors in stepping, performing the secondary task and contacting the obstacle were increased with age and fall risk. The fall-prevention programs were effective by reducing fall rates by 14%, in multifactorial interventions. The interventions aimed at increasing safety at home are efficient in reducing the rate of falls and the risk of falling.

Key words: senescence, fall risk, gait abnormalities.

Rezumat

Modificările date de vârstă se definesc, în privinţa mersului, prin: creşterea înclinării anterioare a pelvisului, scăderea peak-ului extensiei şoldului, creşterea peak-ului extern al flexiei şoldului, reducerea flexiei genunchiului, scăderea puterii de absorbţie a genunchiului în prebalans, scăderea flexiei plantare a gleznei şi a forţei generate de gleznă.

Vârstnicii cu risc crescut de cădere prezintă un răspuns semnificativ mai lung şi un timp de transfer mai mare decât al tinerilor. Erorile în derularea paşilor, performarea sarcinilor secundare şi contactul cu obstacolele au crescut cu vârsta şi riscul de cădere. Programele de prevenire a căderilor au fost eficiente, prin scăderea căderilor cu 14%, în intervenţiile multifactoriale. Intervenţiile de creştere a siguranţei la domiciliu sunt eficiente în reducerea ratei şi a riscului de cădere.

Cuvinte-cheie: senescenţa, risc de cădere, tulburări de mers.

Kinematics of the pelvis and legs in elderly and young adults. Kinetic changes unrelated to the walking speed

The decrease of hip extension and the increase in the forward pelvic tilt among the elderly population are both specific to dynamic walking and they do not occur while standing. Comparative surveys were conducted on elderly people with an average age of 71 years and on young adults with an average age of 26 years. They were studied while standing and walking comfortably, at low and high speed.

The kinematics of the pelvis and legs was measured using a three-dimensional movement-analysing video system. The peak of the hip extension and the forward pelvic tilt were thus determined; while standing, there were no significant statistical differences between the elderly and the younger subjects, with respect to the hip extension and the forward pelvic tilt.

At a comfortable walking speed, the elderly group had a decrease in the hip extension peak and a higher forward pelvic tilt compared to the young adult group. At a fast walking speed, the extension peak was significantly lower within the elderly group compared to the young adult group. However, there were no significant differences in this respect during slow speed walking. Age-related changes are defined, in terms of walking, by reduced hip extension and increased pelvic tilt, which is rather a dynamic phenomenon than a phenomenon incurred while standing (Lee et al., 2005).

The decrease of hip extension among the elderly becomes even more visible in frequent fallers. The use of a three-dimensional system to conduct an optoelectronic analysis of movement allowed the performance of a comparison between the entire kinematic walking chain, from a sagittal point of view (from the viewpoint of movements made at leg joint level and at pelvic level), in

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elderly people and in young adults, as well as a comparison of the same between elderly people who suffered frequent falls and those who did not fall at all. The comparison was made on each elderly group, during comfortable and fast walking. It was performed in a walking laboratory, on 23 healthy elderly people, 16 elderly people known to be fallers or healthy old people having a history of recurrent falls, and 30 young adults. The following were assessed: the pelvic position and the peak of joint angles; the hip extension peak was the only parameter of the leg joint, measured during walking, which proved to be significantly lower in the elderly group (both fallers and non-fallers) compared to the group of young adults. This parameter evidenced equal regressions in the group of elderly people who had frequent falls, and those who were not known to be fallers ($p \leq 0.05$). The hip extension peak +/- the standard deviation during comfortable walking was around 20.4º+/- 4º for the young adults, 14.3º+/- 4.4º for the group of elderly people without falls and 11.1º+/- 4.8º for the group of elderly people who had frequent falls. The hip extension peak showed no significant improvement among the elderly, during fast speed walking (Kerrigan et al., 2001). The reduced walking hip extension among the elderly, which was exaggerated among old people with frequent falls, impaired the walking performance and the general functionality of the hip.

Surveys were conducted on the kinetic alterations occurring among the elderly, unrelated to the walking speed. Among the elderly people who had frequent falls, these kinetic alterations were comparable, for the comfortable walking speed, to those recorded among the elderly with no falls, at fast walking speed. This was proven through retrospective studies, by the use of the strength platform in elderly people who, for unknown reasons, had at least 2 falls during the last 6 months and in elderly people with no history of recurrent falls.

The differences in the peak of joint kinetics (moment and power) were assessed during the gait cycle, and they were compared in elderly with a history of recurrent falls, during comfortable and fast speed walking.

The significant differences were analysed for 4 sagittal plane parameters, both for comfortable and for fast walking speed: an increase in peak external hip flexion moment in stance, a reduction in peak hip extension moment, a reduction in knee flexion moment in preswing and a reduction in knee power absorption in preswing. The presence and the persistence of the 4 kinetic alterations, both at comfortable and at high speed, implies the existence of different inherent specific patterns and allows for new approaches in analysing the walking mechanism of elderly people who have frequent falls. These joint kinetic alterations could serve as potential markers for detecting the risk of falling among the elderly (Kerrigan et al., 2000).

Some surveys tried to identify biomechanical gait alterations unrelated to the walking speed among healthy elderly people, and for this purpose, they analysed the decrease in power and in gait performance. Thus, they identified the age-driven changes in the biomechanics of gait and attempted to determine whether these changes were still present when the walking speed increased.

The different values in the peak of various joint movements (from a kinematic point of view), as well as the joint momentum and strength (from a kinetic point of view) were determined, and these values were compared for the healthy elderly group and for the young adult group at comfortable and at high walking speed. The survey was conducted on 31 healthy old persons (between 60 and 84 years old) and on 31 healthy young adults (between 18 and 36 years old), without any known neurological, musculoskeletal, cardiac or pulmonary disorders. During the gait cycle, the major kinematic and kinetic peaks were assessed. Several kinetic and kinematic differences were detected between the elderly and the young adults, but they did not persist once the walking speed was increased. The differences that did persist, even after moving from comfortable to fast walking, were: decrease in the hip extension peak, increase in the anterior pelvic tilt, decrease of the ankle plantar flexion, reduction of the ankle power generation. Gait performance can be impaired in elderly people through two factors: hip flexion contracture and ankle plantarflexor concentric weakness (Kerrigan et al., 1998).

The gait pattern of 8 elderly people (66.8+/-5.4 years) and 12 young adults (26.6+/-2.8 years) was recorded for normal walking speed (1.0 m/s, 1.3 m/s, 1.6 m/s). There was no difference in speed between the groups. Combining speeds among the healthy elderly group led to a 17% drop in the ankle generated force and a 12% drop in the mechanical work generated by the joint ($p \leq 0.05$). In elderly people, these changes were associated with a reduced plantar ankle flexion, as well as an increase in the hip flexion and in the anterior pelvic tilt ($p \leq 0.05$). The elderly take various walking patterns; at rapid walking speed, the hip flexion propels the leg during balance, when the ankle plantar flexion is low (Cofre et al., 2011).

Efficiency of fall-prevention programmes among the elderly. Influencing the falling rate and the falling risk among the elderly

Some surveys were conducted on the efficiency of fall-prevention programmes among the elderly, by reviewing randomized controlled trials, between 2000 and 2009. The parameters measured were the number of falls and the falling rate. The fall prevention programmes implemented so far were quite efficient, as they reduced the number of falls by 14%, through multi-factor interventions. There were no variations between multi-factor interventions and single-factor interventions. Among the elderly living in the community, who received assistance at home, the falling rate dropped by 9% (Choi, 2012).

The fall-risk reduction interventions were assessed among people aged over 65, through 159 trials, attended by 79193 participants. The prevention intervention was compared to the situation when no measures were taken.

In the multiple component exercise groups, the falling rate and the falling risk dropped significantly. The application of the Tai Chi type programme led to a significant drop in the falling risk. The multi-factor intervention that included the assessment of individual risk led to an important drop in the falling rate, without, however, influencing the risk of falling.

Additional vitamin D intake influenced neither the falling risk nor the falling rate. The interventions aimed at

increasing safety at home were efficient in reducing both the falling risk and the falling rate. These interventions proved to be more efficient in the case of elderly people with a high risk of falling, including those with severe sight impairment. These interventions meant to increase safety at home were specific to occupational therapy. A sight issues analysis among the elderly revealed a significant increase in both the rate and the risk of falling. Correcting these sight issues through the use of multi-focal lenses led to a significant drop in the falling risk among the subgroup of elderly people involved in outside activities. Pacemakers reduced the falling rate among those suffering from carotid sinus hypersensitivity, influencing the risk of falling. The first eye surgery conducted on a woman suffering from web eye reduced the falling rate, while the second surgery, conducted on the other eye, had no effect at all. The gradual withdrawal of psychotropic substances reduced the falling rate but not the risk of falling. Prescribing a modified programme for primary physical care decreased the risk of falling. Wearing non-slippery shoes reduced the risk of falling on ice (Gillespie et al., 2012).

The permanent slippery properties of shoes on ice – the friction coefficient computed for 4 different materials (synthetic rubber, nitrile, natural and polyurethane) were measured on ice (at a temperature of -12 degrees); the rigidity and roughness of the shoes were also measured.

According to the results, polyurethane did not perform better than synthetic rubber, nitrile, or natural on pure ice (-12 degree). A rough sole was positively associated with the friction coefficient; the best slipping material on the floor (polyurethane) did not offer enough slipping capacity on ice (Gao et al., 2004).

By comparing the ankle-foot complex among impaired elderly and those suffering from pain in that area through multi-faced and standard stepping measurement, it has been established that after an exercising programme, the falling rate drops but the risk of falling does not.

The effect of cognitive behaviour also bears an influence on the falling rate, while it has no influence at all on the risk of falling. Several interventions were initiated in order to increase the knowledge/education level among the elderly, for fall prevention purposes. These trials comprised interventions concerning the exercises performed at home by those aged over 80, they assessed home safety and the changes made prior to the fall occurrence, including a multi-functional programme focusing on specific risk factors. The home exercising programmes aimed at increasing safety at home (through adaptation) led to a drop in the fall rate and in the risk of falling. The multi-factor assessment and the interventions made through prevention programmes reduced the falling rate but they did not influence the risk of falling.

The risk factors encountered at home are associated with the decay of physical abilities and the exposure to surrounding stress elements, thus leading to an increased risk of accidental falling, especially outside the home. There is no linear relation between mobility and accidental falls; a good mobility makes, however, elderly people more likely to resist falls. A decrease in the falling incidents occurring at home is included in the fall prevention strategy and the strategy to reduce the risk of falling among the elderly, focusing on mobility-impaired elderly people with a history of falling (Lord et al., 2006).

Home safety guide

Issues:

1) The floor

- Potential risk of falling: polished or wet surfaces that facilitate slipping
- Adapting recommendations: non-slippery sandstone in the bathroom, non-slippery carpets in the bathroom, toilet, kitchen.

2) Rugs

- Potential risk of falling: elderly people can trip on thick rugs
- Adapting recommendations: thin rugs, without thick edges

3) Carpets

- Potential risk of falling: they can be slippery
- Adapting recommendations: non-slippery carpets

4) Light

- Potential risk of falling – low light – risky
- Adapting recommendations: strong lights in high risk places – stairs, bathroom, bedroom

5) Glow

- Potential risk of falling – things that glow in the sun
- Adapting recommendations: polarized glass windows or curtains, careful positioning of the lamps

6) Stairs

- Potential risk of falling – low light – risky
- Adapting recommendations: switchers on both ends of the stairs, non-stop night lamps, duct tape on the stairs. The stairs must not be higher than 14 cm.

7) Rails

- Potential risk of falling – no rails – risky
- Adapting recommendations: place rails on both sides of the stairs

8) Sink and towel stand

- Potential risk of falling – slippery – risky
- Adapting recommendations: to be placed at an adequate height and location.

9) Toilet set

- Potential risk of falling – low chair – risky
- Adapting recommendations: higher toilet chair.

10) Bath or shower tub

- Potential risk of falling – slippery – risky
- Adapting recommendations: non-slippery surface and support rails on the walls, flexible shower, possibly equipped with a chair.

11) Bed

- Adapting recommendations: adequate height for an optimal transfer.

12) Mattress

- Adapting recommendations: well balanced and fixed

13) Chairs

- Adapting recommendations: adequate height with arms support

14) Shelves

- Adapting recommendations: adequate height in the kitchen and bathroom

15) Gas

- Potential falling risk: asphyxiation risk

- Adapting recommendations: marking the open/close position in an obvious, clear manner.

16) Temperature

- Potential falling risk: hypothermia risk at low temperatures

- Adapting recommendations: maintaining an optimal temperature during winter

Postural adaptations and temporal gait in elderly exposed to sliding

Adjusting walking stability while exposed to recurrent sliding, in view of reducing the backward balance, was recorded among young adults who experienced a sliding block before and after sliding.

The stability starting points for all types of sliding were obtained by shortening the landing distance (slide of the ipsilateral leg or arm) compared to the chondrolateral leg or arm, by measuring the center of mass (COM), the position and the relative speed of the base of support (BOS), as well as by using the mathematical prediction of the limit point for losing the backward balance.

The improvement of pre- and post-sliding stability was correlated with a decrease in the incidence of balance losses, from 100% (at the first slide) to 0% (at the fifth slide). For a short period of time, the improvement of pre-sliding stability was influenced by a proactive anterior shift in COM position. A significant improvement in post-sliding stability can be obtained by a reduction in the BOS perturbation intensity determined by a reduction in the demand on post-sliding onset braking impulse. This influences stability through proactive adjustments in the posture and gait pattern (position of the COM, step length, horizontal landing of the leg, increase in the knee flexion) before sliding.

The adapting control processes undergo a maturation process, defined by a support change in the control feed-back for posture correction, with an improvement of pre-sliding stability and of posture alteration intensity. The stability of the chondrolateral leg is a high predictor for incidental balance reduction (Bhatt et al., 2006).

Some surveys have been conducted to analyse whether the falling resistance learned during a single disturbance session can be maintained for six months, through additional sessions, among elderly people (aged over 65) living in the community. The initial disturbance exercise was conducted on all subjects, using a minimum friction platform in order to introduce an unannounced element by repeating the slide on the right side. There was one group session, repeated six months later. There was also a second group who had an extra sliding exercise three months after the initial one and then, the experience was repeated after six months. The following were assessed: result of sliding (falling incidence, balance loss), dynamic stability (based on the barycentre position and speed), vertical leg support (based on the hip height). Subjects from both groups had a significant drop in the falling and balance loss rate between the first and the last sliding exercise, showing an increase in stability and in the support leg control. Both groups proved to be able to remember significant information on all measuring results conducted after 6 months, compared to the first slides. The additional sliding exercises conducted at 3 months showed a better stability control and a drop in the balance loss rate. The movement memory can be kept for six months or more, after one single training session for falling resistance, although one single assisted fall may later stop the falling. Based on this sliding and falling experience, it is possible to "inoculate" the elderly against potential falls and their consequences (Bhatt et al., 2012).

Adults and elderly people who suffer from posture disorders that translate into missteps and sliding need to compensate these deficiencies quickly, in order to prevent the fear of falling. While tripping and falling, the ability to move one's torso is different in elderly people who fall compared to those who are afraid of falling. This ability can be quickly regained by the elderly, through specific task training. Acquiring new movement skills is associated with a lower risk of falling, during missteps. Falling prevention exercises, involving torso kinematics, will lead to a decrease in the falling rate and in the number of post-fall injuries among the elderly (Grabiner et al., 2008).

The lateral step initiation among the elderly was analysed and it showed various posture responses during voluntary or induced lateral step initiation. The cases where different stepping strategies were developed during lateral step initiations among the elderly were quantified and thus, the type of walking responsible for a history of recurrent falling was identified. 70 elderly people (with an average age of 76 years) participated in left/right voluntary lateral steps, trying to move as quickly as they could, as a reaction to a visual cue, within a blocked space. The vertical ground reaction force was measured with a force platform, the number and the latency of postural adjustments being thus quantified. The assessment was based on stepping strategies. The frequency of 1 or 2 adjustment trials was compared to the data collected from 20 young adults (average age – 38 years), the number of the falls recorded in the year previous to the one when the survey was conducted being correlated with the number and the latency of postural adjustments. Unlike the young adults, who almost always showed a postural adjustment during lateral stepping, the elderly subjects showed a continuous percentage variation in using one postural adjustment (from 0% to 100% per trial). The latency of the initial postural adjustment and the leg lifting varied, depending on the number of postural adjustments conducted. The falling history was largely associated with 2 posture adjustments and a higher latency in leg lifting. The number and the latency of postural adjustments conducted during lateral stepping are good indicators for lateral postural control among the elderly (Sparto et al., 2014).

The age-driven decay of the physiological components of balance control increases the risk of falling. The fear of falling translates into a high use of cognitive processes in order to select the right movements and the right stepping solutions.

The importance of cognitive tasks, as well as that of obstacles to stepping, affecting the initiation and the execution of the selection stages for stepping reactions, was analysed in young and elderly adults. Three groups were assessed: young adults (23-40 years old), elderly people with a low risk of falling (77-86 years old), and elderly people with a high risk of falling (78-88 years old). 4 circumstances were analysed: stepping choice, stepping

selection and the presence of obstacles, stepping selection and memory involvement, stepping choice, memory involvement and the presence of obstacles. The stepping reaction time and the transfer time were measured for each circumstance, also adding hesitant stepping, obstacle contact and memory test errors. The elderly subjects showed a significantly longer reaction time and a longer transfer time than young adults. The reaction time and the transfer time were longer among those with a high risk of falling than among those with a low risk of falling. In terms of memory involvement, the reaction time was affected to a minimum among the young adults (7% increase), but it was significantly slowed down among the elderly people with a high risk of falling (over 48%), while among the elderly people with a low risk of falling it was recorded at an intermediate level (42%).

The presence of obstacles had a small but important impact on the reaction time (9.4%) and led to an increase in the transfer time (43.3 %), without, however, showing any difference between the groups. The number of errors made while taking steps, while performing secondary tasks or during obstacle contact increased with age, as well as the risk of falling. The elderly subjects exposed to a high risk of falling showed lower abilities to take correct voluntary steps, compared to the young adults, especially in the particular situations when their attention was divided (St George et al., 2007).

Compensatory stepping and grasping reactions have an important role in the sudden loss of balance and they play a crucial part in falling prevention. The ability to execute these reactions is impaired among the elderly. Balance disturbances were analysed during the training programme. An age-driven dysfunction was recorded, in terms of walking compensation and regaining the catching impulses during balance, among 30 elderly people (64-80 years) with a recent history of falling or self-supporting unbalance. Assessments were made at 6 weeks, focusing on balance disturbance (using a walking platform). A balance training programme was conducted and 6 weeks later, the increase in the flexibility and relaxation control was checked.

The perturbing programme was aimed at the following properties of balance reactions: multi-step reactions, extra-lateral steps following anteroposterior disturbances, foot collisions following side disturbances, time to complete grasping reactions.

The reactions were tested on an unpredictable, high translation surface. Compared to the control programme, the disturbance training showed significant decreases in the frequency of multi-step reactions and of foot collisions following side disturbances – statistically significant for the translation. A significant increase in the time of contact with the hand bar was recorded among the group tested on the translation surface, compared to the control group, without disturbance training (Mansfield et al., 2010).

The balance reactions and the hand catching movements made during fast walking are crucial for falling prevention. These compensating reactions are quicker than the volitional movements made by the legs and arms, thus becoming efficient in decreasing the centre of mass, in the case of movements triggered by unexpected balance disturbances.

The age-driven deterioration of the nervous, sensory and musculoskeletal systems can impair the ability to execute these specific reactions. There are several issues disturbing the side stability control while walking, among healthy elderly people: stopping the lateral body movement during backward or forwards steps and controlling the lateral movement of the leg, in order to prevent the collision between the moving and the supporting leg, during lateral steps. The elderly show a stronger faith in hand reactions than young people do, but they lose the capacity of executing quick catching reactions. The evaluation of the compensating steps and hand stretching reactions is important for identifying the individual risk of falling and for determining the specific balance-control issues, as well as for determining the necessary interventions during strength training. It is important to associate these issues with side stability control, side falls being responsible to a great extent for the occurrence of hip fractures (Maki et al., 2006).

Controlling the dynamic mediolateral stability during volitional stepping is a challenge for the elderly, this stability being largely responsible for falls and for the occurrence of hip fractures.

Young adults (24 years old) were compared to elderly people (71 years old) while performing 3 separate tasks comprising 1 step, at various speeds and step positions, with various challenges for setting dynamic stability. The trajectory of the total body centre of mass (COM) was calculated. The mediolateral inconsistency of the COM is different between the lateral and the final peak of the COM positions. The variation of this inconsistency was computed as an indicator of dynamic stability. The elderly people showed a higher dynamic instability compared to the young adults, translating into an increase of COM inconsistency. The higher alterations in the COM kinematics during the stepping initiation and the balance stage are a proof of stability issues (Singer et al., 2013).

Time pressure influences movement synchronisation and dynamic stability. The young adults and the elderly subjects conducted exercising series including quick leg flexions while standing, coupled with simultaneous extensions of the ipsilateral index, thus minimising the difference between the heel and finger movement onset.

This task was conducted twice, in two different circumstances: self-initiated (SI) and reaction time (RT). Time pressure changes the synchronising movements: finger extension happens before the heel balance in RT and the other way around in SI. The synchronising errors associated with the standard deviation were significantly higher among the elderly in SI, given the fact that self-perception is crucial for time-coordination.

On a secondary level, both groups showed a significantly shorter mediolateral anticipatory postural adjustment duration in RT (increased temporal pressure) compared to SI. This shortening was compensated by an increase in the anticipatory peak of centre-of-gravity (CoG) acceleration, during posture. This increased CoG acceleration was associated with an increased anticipatory peak of the mediolateral centre of pressure, shift towards the swing-leg, but only in young adults.

This ability to accelerate CoG, correlated with the centre-of-pressure, is impaired in the elderly people by:

insufficient leg muscles, a decrease in dynamic leg stability, thus leading to an increase in the risk of perturbing the mediolateral balance and in the risk of falling (Hussein et al., 2013).

With older age, the anterior stepping threshold, but not the posterior stepping threshold, is reduced. 30 young adults (31 years old) were compared to 11 middle aged adults (57 years old) and to 11 elderly people (73 years old). The testing surface was chosen in such a way that the subjects stayed on a moving carpet, operated by a microprocessor. The ability to execute the forward step decreases with age. A slight transfer disturbance among the middle aged and the elderly people is based on dynamic instability while initiating the step. Posterior stepping thresholds were not influenced by age (Crenshaw & Grabiner, 2014).

Side falling, very frequent among the elderly, is associated with a high risk of hip fracture, compared to other types of falling. Quick movements play an important functional role in balance keeping, side stepping requires a complex control and a moving load. Reactions to rapid stepping were analysed in healthy young adults (20-30 years) and elderly people (65-73 years) voluntarily exposed to an unpredictable sudden movement, on a platform. A video-analysis system described the walking pattern, through a side-walking platform. During lateral disturbances, while in static stage, the elderly were more prone to take multiple steps or to use their arm reactions in order to maintain their balance than the young adults were, especially during the walking transition stages. During walk-in-place trials, both young and older subjects more frequently used a sequence of side steps rather than crossovers; older adults were still more likely to take extra-steps or use arm reactions. In 55% of the walk-in-place trials conducted among the elderly, shocks were recorded between the leg balance and the stance limb, while among the young adults, the percentage was only 8%. Active and healthy elderly people seem to have difficulties in controlling their side stepping, before reporting problems in controlling their forward and backward stepping. Insufficient reactions aimed at controlling lateral stepping can be an early indicator of high lateral-falling risk and high hip fracture risk, thus being used in predicting and preventing falls and their consequences (Maki et al., 2000).

Testing the slipping resistance and determining the critical behaviour differences between assisted slips, up to the moment of complete after-fall recovery, are important components in falling prevention. Ground reaction forces at the shoe-floor interface are the most important biomechanical factor while slipping. The ratio of the shear to normal foot forces generated during gait, known as the required coefficient of friction (RCOF) if it is measured during normal movement on a dry surface and as "friction used/achievable" if it is measured while slipping, is a biomechanical variable closely associated with the measurements of the frictional properties of the shoe/floor interface.

Biomechanics depend on the system's capacity to issue posture, mental, individual and environment perception control. Improving the frictions on the shoe/floor interface and improving walking safety lead to a decrease in the risk of slipping (Redfern et al., 2001).

Biomechanical analysis is necessary for researching the slipping components/for preventing falls. The unexpected occurrence of accidental slips in real life is a challenge for biomechanical surveys. The biomechanical changes of the gait were quantified among subjects exposed to an anticipated slippery environment. Foot ground reaction forces and the body dynamics were assessed in 16 subjects, during level walking and during downhill walking, with various friction properties and various declivity angles. Gait biomechanics were compared in three trials conducted on dry land: reference (subjects walking on a dry floor), anticipation (subjects who did not know exactly whether the floor was in various contamination stages – dry, contaminated with water, oil, soap, etc.), recovery trials after the contaminated trial (subjects who knew again that the floor was dry).

The anticipation trials produced the necessary peak required coefficient of friction (RCOF peak), reaching average values of 16-33%, significantly higher than the data collected during the reference trial and thus, reducing the slipping risk during the recovery trial. The RCOF peak did not go back to the reference value (5-12% lower).

The postural and temporal gait adaptations, which affected the ground reaction forces, were used to achieve RCOF (peak) reductions. The statistically significant gait adaptations included: reductions in stance duration and decreasing the supporting foot speed, shortening the normalized stride length, reducing the foot-ramp angle and slower angular foot velocity at heel contact. These adapting measures – the anticipation of a slippery surface, the significant changes in lower extremity joint moments – can be seen in the reactions recorded by muscles, in general, and they can decrease the slipping/falling risk (Cham & Redfern, 2002).

The lower extremity joint moments and the postural adjustments, as well as the correcting strategies adopted while slipping, were assessed in an attempt to prevent falling. The subjects walked on a slippery vinyl floor, with a ground reaction force and a body motion recorded at 350 Hz. The initiation of corrective body motion in an attempt to prevent falling became obvious at around 25% of the stance and it kept being visible up to around 45% of the stance, with an average between 190-350 ms, after heel contact. These reactions include: an increased flexion moment in the knee and extensor activity in the hip. The ankle is a passive joint (no net moment). The joint kinematics shows an increase in knee flexion and in the forward rotation of the leg, in an attempt to regain balance during falls. The ankle kinematics plays a less important role compared to the knee, in fall preventing attempts (Cham & Redfern, 2001).

The falling incidence can be decreased among elderly people by teaching them a better repositioning while adjusting their posture. The subjects (healthy elderly people and young adults) were exposed to induced slides, by use of a bilateral, low friction platform, while standing. They were exposed to 5 slides, in blocked non-slippery trials, with two repeated exposures to slipping. The first slip was new and unexpected. The effect of age on the groups, the incidence of falling (revealed by the excessive lowering of the hip) and the direction of the protective step taken were examined. After the first slip, the percentage of fallen

people was higher among the elderly group than among the young adults, 73% vs. 28%. When repeating the slip, the percentage of those who fell dropped exponentially in both age groups. The subjects learned to slip without falling. There were repeated falls, without any change in the walking style, recorded for 63% of the falls. The percentage of those who fell later, when they were re-exposed to slipping, was still higher among the elderly (20% vs. 2%). In general, there were less accidental falls recorded than the initial number.

A forward or backward half-step ensures the success of recovery, by repeating the exposure and re-exposure to slipping, without significant differences between the age groups. The elderly are more prone to initial falling, due to unexpected disturbances but, when they are re-exposed to the same factors, both the healthy young adults and the elderly quickly learn to avoid falling. At the same time, healthy elderly people are capable of learning a better recovery through posture adjustments during repeated exposures (Pavol et al., 2002).

Conclusions

1. Age-related changes are defined, in terms of walking, by: a decrease in the hip extension peak (which is rather a dynamic phenomenon than a phenomenon encountered while standing), a higher outside hip flexion peak, a lower knee flexion, a decrease in the knee absorption powers while in pre-balance (both during comfortable and rapid speed walking), a reduction of the ankle plantar flexion, and a lower ankle-generated force.

2. The fall prevention programmes implemented so far are quite efficient, as they have reduced the number of falls by 14%, through multi-factor interventions. The interventions aimed at increasing safety at home are efficient in reducing the falling rate and the risk of falling.

3. Elderly people exposed to a high risk of falling show a significantly longer reaction time and a longer transfer time than young people do. The number of errors made while walking, while performing secondary tasks and during obstacle encounters increases with age, along with the risk of falling.

Conflicts of interest

Nothing to declare.

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Objectives and principles of treatment in idiopathic scoliosis
Obiective şi principii de tratament în scolioza idiopatică

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Abstract

Treatment of idiopathic scoliosis, representing 80% of all cases of scoliosis, has as main objectives: to stop curve progression at puberty (or even reduce it), to prevent or treat respiratory dysfunction, to prevent or treat spinal pain syndromes, to improve aesthetics by postural correction. For each patient, the specific objectives must be set according to the actual clinical condition (scoliosis degree, age at diagnosis).

The choice of treatment methods in evidence-based clinical practice will be done by correlating the information provided by evidence-based medicine with a physical examination performed by a scoliosis specialized physician and with patient preferences: simple observation at 3, 6 or 12 months, physiotherapeutic specific exercises (outpatient or inpatient), night-time, part-time or full-time bracing or fusion surgery.

The most important prognostic factors are: family history, proven progression, decompensation, short curve, pain, flat back (kyphosis reduction) and aesthetic impact.

Physiotherapeutic specific exercises are the first step in scoliosis treatment in order to prevent progression during growth and should be based on three-dimensional auto-correction, training in activities of daily living (ADL), stabilizing the corrected posture, and patient education. Methods with proven efficacy are DoboMed, Lyon, Schroth, Scientific Exercise Approaches to Scoliosis (SEAS), side shift. These exercises are also recommended during bracing and even in painful operated patients. Exercises to improve respiratory function are recommended when needed and during bracing. Sports activities are not a specific treatment for scoliosis, but they are complementary recommended for maintaining general fitness and for their psychological and neuromotor benefits.

Key words: scoliosis, treatment, objectives, physiotherapeutic exercises.

Rezumat

Scolioza idiopatică, reprezentând 80% din totalul cazurilor de scolioză, are ca obiective principale de tratament stoparea progresiei curburilor la pubertate (sau chiar reducerea acestora), prevenirea sau tratarea disfuncţiei ventilatorii, prevenirea sau tratarea durerilor de la nivelul coloanei vertebrale, ameliorarea estetică prin corectare posturală. Pentru fiecare pacient în parte, obiectivele specifice vor fi stabilite în funcţie de situaţia clinică concretă (severitatea scoliozei, vârsta în momentul diagnosticului).

Alegerea metodelor de tratament în cadrul practicii clinice bazate pe dovezi se va face prin corelarea informaţiilor furnizate de medicina bazată pe dovezi cu datele examenului obiectiv realizat de către medicul specialist şi cu preferinţele pacientului: simpla observaţie la 3, 6 sau 12 luni, exerciţii kinetoterapeutice specifice în regim ambulatoriu sau prin internare, ortezare nocturnă, cu timp parţial sau continuă, respectiv intervenţie chirurgicală de fuziune.

Cei mai importanţi factori de prognostic sunt: antecedentele familiale, progresia dovedită, decompensarea, curbura scurtă, durerea, spatele plat (diminuarea cifozei) şi impactul estetic.

Exerciţiile kinetoterapeutice specifice reprezintă primul pas în tratamentul scoliozei pentru prevenirea progresiei în timpul perioadei de creştere şi trebuie să fie bazate pe autocorecţie tridimensională, antrenarea ADL-urilor, stabilizarea posturii corectate şi educaţia pacientului. Metode cu eficacitate dovedită sunt: DoboMed, Lyon, Schroth, SEAS, side shift. Aceste exerciţii se recomandă şi în perioada ortezării şi chiar la pacienţii operaţi în caz de durere. Exerciţiile pentru ameliorarea funcţiei respiratorii sunt recomantate la nevoie şi în timpul ortezării. Activităţile sportive nu reprezintă un tratament specific pentru scolioză, dar sunt recomandate complementar pentru beneficiile psihologice, neuromotorii şi menţinerea condiţiei fizice generale.

Cuvinte cheie: scolioza, tratament, obiective, exerciţii kinetoterapeutice.

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Introduction

Scoliosis represents a three-dimensional torsional deformity of the spine and trunk, causing a lateral curvature in the frontal plane, an axial rotation in the horizontal plane, and a disturbance of the sagittal plane normal curvatures (Grivas et al., 2008). Usually, kyphosis and lordosis tend to be reduced towards a flat back.

80% of the cases of scoliosis are idiopathic. The prevalence of adolescent idiopathic scoliosis with a Cobb angle greater than 10° varies in the general population between 1 and 12%, according to different epidemiological studies. It is very likely also influenced by latitude (Grivas et al., 2006; Wong et al., 2005).

Adolescent idiopathic scoliosis is more frequently progressive in girls, especially for higher Cobb angles. So, for a Cobb angle between 10 and 20°, prevalence is similar for boys and girls, while for angle values between 20 and 30°, girls have a more than 5-fold increased prevalence, and for a Cobb angle above 30°, the prevalence is 7-fold higher in girls (Parent et al., 2005).

Even if idiopathic scoliosis may develop throughout the whole period of childhood and adolescence, it is most common during the growth spurt periods, between 6 and 24 months, between 5 and 8 years, and between 11 and 14 years (Negrini et al., 2005). In adulthood, the potential for progression is much lower, unless the Cobb angle is above 30°, wherefrom the risk for progression starts to increase as the curve grows. Also, a scoliosis angle at the end of growth that is over this critical threshold (for other authors up to 50°) increases the risk of health problems in adult life, a lower quality of life, cosmetic deformity, disability, pain and progressive functional limitation (Negrini et al., 2006a).

General goals of conservative treatment

According to the 2011 Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT) guidelines (Negrini et al., 2012), the basic objectives of comprehensive conservative treatment of idiopathic scoliosis are:

1) To stop curve progression at puberty
2) To prevent or treat respiratory dysfunction
3) To prevent or treat spinal pain syndromes
4) To improve aesthetics via postural correction.

Specific goals of conservative treatment

Specific goals should be defined for each patient from the beginning of conservative treatment, mainly based on the x-ray examination of the spine, and afterward dynamically adapted according to the change in deformity and patient compliance. For each patient, we should set primary goals, secondary goals and absolute goals (Negrini et al., 2012). Primary goals are set at the beginning of treatment, representing the best theoretically possible outcome in a specific clinical situation, but they cannot be achieved in all cases. Secondary goals are compromise goals, set when it becomes clear that primary goals cannot be achieved, but they are not always reached either. Absolute goals represent the minimal outcome that must be achieved in any case: avoid fusion surgery.

Therapeutic measures

Current guideline recommendations for the treatment of idiopathic scoliosis are centered on an evidence-based practical approach scheme. Each clinical situation is categorized according to the age of the patient and the Cobb angle value. For a specific patient, the treatment scheme should be chosen from a range of possible treatment schemes, graded from the least to the most efficient one, but keeping in mind that the most efficient is also the most demanding one (Negrini et al., 2008a). The choice of treatment should be the result of the integration of knowledge provided by evidence-based medicine, individual clinical expertise and patient preferences. The advantage of this type of therapeutic approach is the avoidance of overtreatment or undertreatment.

Treatment options are physiotherapy, corrective bracing, or surgery for mild, moderate, or severe scoliosis, respectively, with both the actual degree of deformity and prognosis being taken into account (Kotwicki et al., 2013).

So, the possible treatment scheme to be proposed to a patient with idiopathic scoliosis is (graded from the least efficient to the most efficient, but also the most constraining one): no treatment at all, observation every 36 months, observation every 12 months, observation every 8 months, observation every 6 months, observation every 3 months, physiotherapeutic specific exercises as outpatient, night-time rigid bracing (8-12 hours), inpatient rehabilitation, specific soft bracing, part-time rigid bracing (12-20 hours), full-time rigid bracing (20-24 hours) or cast, surgery (Negrini et al., 2012).

The most important prognostic factors are: family history, proven progression, decompensation, short curve, pain, flat back (kyphosis reduction) and aesthetic impact.

The results of a very recently published research (Fusco et al., 2014) emphasize that conservative treatment initiated already in childhood may favorably change the natural history of juvenile idiopathic scoliosis, with the aim of reaching a curve as far as possible from surgical thresholds. Observation, physical exercises, braces can be useful tools in the hand of physicians, but they must be carefully utilized.

Physiotherapeutic specific exercises

A recent Cochrane review has come to the conclusion that there is evidence in favor of exercises as an adjunctive treatment, but of low quality (Romano et al., 2012). Also, the other recent systematic reviews of all the existing studies show the effectiveness of physiotherapeutic specific scoliosis exercises and that auto-correction is the main goal (Fusco et al., 2011; Mordecai et al., 2012; Negrini et al., 2008b). These exercises have been shown to be effective in reducing the progression rate (in early puberty) and/or improving Cobb angle (around the end of growth), as well as in reducing brace prescription (Negrini et al., 2014).

According to the SOSORT consensus paper of 2005, physiotherapeutic specific exercises should always include: three dimensional auto-correction (3D), training in ADL, stabilizing the corrected posture, and patient education (Weiss et al., 2006). A lot of methods ("physiotherapeutic

specific exercises schools") have been developed, but only some of them have published scientific proofs of efficacy: DoboMed, Lyon, MedX, Schroth, SEAS, side shift (Negrini et al., 2012).

The Schroth school has proved its efficiency both for intensive inpatient rehabilitation and outpatient approach. The primary goals of this method, founded in 1920 by Katharina Schroth (Weiss, 2011), are to facilitate correction of the asymmetric trunk and the ability to maintain this in activities of daily living. The treatment program consists of specific exercises and postural techniques and bracing, depending on the curvature pattern, skeletal maturity, risk of progression, and compliance of the patient. The physical therapist uses exteroceptive stimulation and applies passive detorsional forces to facilitate three-dimensional corrections. Corrective breathing techniques enable detorsion of the rib cage to correct the collapsed areas of the trunk (Bettany-Saltikov et al., 2014). For inpatient rehabilitation, the length of stay is between 4 and 6 weeks, with daily sessions: 2 group-sessions of 1.5 hours each, in the morning and in the afternoon (groups are matched according to the individual curve pattern), and shorter individual training sessions between. After discharge, patients should practice their individualised 30-minute exercise program daily.

In order to develop and maintain the correction of the scoliotic posture, asymmetric positioning is used, based on targeted stretching of the collapsed areas of the concave trunk. Overcorrected positions are used. Mirrors are placed in front and at the back of the patient. Therapist assistance is essential in the Schroth program, providing support by guiding resistances, auxiliary handholds, auditory feedback, and specific verbal instructions. Exercises for the correction of the scoliotic posture include: elongation, realignment of trunk segments, positioning of the arms, specific corrective muscle tension.

The primary focus during breathing therapy using the Schroth method is to develop corrective breathing patterns with the help of manual resistances. Mobilization of the restricted thoracic concave side ribs leads to corrections from "inside the body" by improving selective expansion and reduces rotation of the vertebral bodies (Fusco et al., 2011).

DoboMed is a difficult method, developed in Poland by Professor Dobosiewicz. The principle is to correct scoliosis by active movements of the vertebral column, the main corrective technique consisting of an active three-dimensional auto-correction, with special emphasis on the kyphotization of the thoracic spine (Dobosiewicz et al., 2008). The exercises, performed in closed kinematic chains, are based on symmetrically positioned pelvis and shoulder girdle, so that the vertebrae belonging to the primary curve are mobilized from their pathological position towards their normal position in the axial plane of the trunk. Selective respiratory movements guide the derotation of the thoracic spine (Bettany-Saltikov et al., 2014). The last stage is the active stabilization of the corrected position, endured as postural habit (Fusco et al., 2011).

The Scientific Exercise Approach to Scoliosis program (SEAS), based on the former Lyon School methods of auto-elongation, is an auto-correction program. This should be done exclusively by the patient, through spinal deep paravertebral muscles, in all three planes, without external help. The therapeutic goals of the SEAS protocol are to improve spinal stability, to develop balance reactions, and to preserve/improve the physiological sagittal spinal curves (Negrini et al., 2006b). It is founded on the principle of a cognitive-behavioral approach (Fusco et al., 2011).

Side shift exercises consist of auto-correction of the spine curve through a lateral shift of the trunk to the concavity of the curve, so that lateral tilt at the inferior end vertebra is reduced or reversed, and the curve is corrected in the side shift position. For that, patients in standing position are instructed to shift their trunk to the concavity of the curve, to hold the side shift position for 10 seconds, to return to the neutral position, and to repeat the exercise 30 times a day. The method is indicated for scoliosis with a single curve, at any location (thoracic, thoracolumbar, or lumbar). In case of a double major curve, the larger curve is treated. Hitch exercises represent another option for lumbar or thoracolumbar curves: in the standing position, patients are instructed to lift their heel on the convex side of the curve while keeping the lower limb extended, to hold the hitch position for 10 seconds, to return to the neutral position, and to repeat the exercise 30 times a day. In the hitch position, the pelvis on the convex side is lifted, lateral tilt at the inferior end vertebra is reduced or reversed, the curve is corrected and waist asymmetry is diminished. In case of a double major curve, hitch shift exercises could be an option: patients are instructed to lift their heel on the convex side of the lower curve, to immobilize the lower curve by their hand, to shift the trunk to the concavity of the upper curve, to hold the position for 10 seconds, to return to the neutral position, and to repeat the exercise 30 times a day (Fusco et al., 2011; Bettany-Saltikov et al., 2014). Side-shift exercises and hitch exercises are a useful treatment option for idiopathic scoliosis (Maruyama et al., 2008).

According to the 2011 SOSORT guidelines, physiotherapeutic specific exercises should be recommended as the first step of treatment in idiopathic scoliosis to prevent/limit deformity progression and bracing during growth, and should be based on 3D auto-correction, training in activities of daily living, stabilization of the corrected posture, and patient education. A method with scientific proofs of efficacy should be chosen, the therapists should be specifically trained in the method they use, and included in scoliosis treatment teams. Exercises are individualized according to the patients' needs, curve pattern and treatment phase, even if performed in small groups, and should be practiced regularly (Negrini et al., 2012).

The same guidelines recommend that physiotherapeutic specific exercises should also be performed during brace treatment. Spinal mobilization exercises should be used in preparation to bracing, and stabilization exercises in auto-correction during brace weaning. Physiotherapeutic specific exercises are also recommended in painful operated patients, in order to reduce pain and increase function.

Various types of respiratory impairments are present in scoliosis patients: abnormal ventilation patterns (mainly restrictive), impaired function of respiratory muscles, restricted and asymmetric motion of the chest

wall, abnormal patterns of ventilation during exercise. Cardiorespiratory failure is not a common problem, being present only in cases of severe scoliosis, with onset in pre-puberty and with a strong tendency to progression. SOSORT guideline recommendations are to use exercises to improve respiratory function during brace treatment and whenever needed. Physiotherapeutic specific exercises should be used to train regional respiratory strategies in order to promote expansion and ventilation of specific lung compartments (Negrini et al., 2012).

Sports activities are not prescribed as a scoliosis treatment, but they are recommended because of specific psychological, neuromotor and general organic well-being benefits. Physical education at school should be continued. Nevertheless, restrictions may be imposed for certain types of sports activities, according to the severity of the curve and the risk of progression. Sports activities should also be continued during brace treatment, because of physical and psychological benefits, but caution is needed regarding contact and highly dynamic sports. Competitive activities with important mobilization of the spine should be avoided in patients with scoliosis at high risk of progression (Negrini et al., 2012).

Conclusions

1. Conservative treatment initiated as soon as possible may favorably change the natural history of juvenile idiopathic scoliosis.

2. Physiotherapeutic specific exercises are useful tools for the treatment of these patients, on their own or combined with brace therapy, avoiding surgery in a significant number of cases.

Conflicts of interest

There are no conflicts of interest.

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Classification of scoliosis
Clasificarea scoliozelor

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Abstract

The classification of scoliosis is particularly important in the medical management of scoliosis and the maintenance of spinal mobility for as long as possible is important.

In 1983, Howard King classified adolescent idiopathic scoliosis into five distinct types, with specific recommendations for each. A new classification was presented by Lawrence Lenke in 2001, including for the first time sagittal plane changes. Although the Lenke classification is much more complete than that presented by King, it is far from being perfect. It does not include the rotational component involved in the development of scoliosis. New technologies allowing for the three-dimensional reconstruction of the spine can be used for a real 3D classification of scoliosis and for the approach of new therapeutic concepts.

Congenital scoliosis, which occurs during the first six weeks of intrauterine life, can be associated with cardiac or renal malformations. Vertebral malformations may result from the partial fusion of the vertebral bodies. Congenital kyphosis can also develop in this period.

Neuromuscular scoliosis is associated with cerebral palsy, muscular dystrophy, spina bifida.

Idiopathic scoliosis, in which no cause can be identified, is divided depending on the patient's age.

The various conditions that can initially manifest as scoliosis should be taken into consideration: lower limb length differences, bone tumors, infections, antalgic scoliosis. Also, a number of systemic diseases can be associated with scoliosis: Marfan syndrome, Klippel-Feil syndrome, Down syndrome, osteogenesis imperfecta, neurofibromatosis, Ehlers-Danlos syndrome.

Key words: scoliosis, classification, functional scoliosis, structural scoliosis

Rezumat

Clasificarea scoliozelor este deosebit de importantă în managementul medical al scoliozelor, fiind importantă menţinerea mobilităţii coloanei cât mai mult timp posibil.

În 1983 Howard King clasifică scolioza idiopatică a adolescentului în cinci tipuri distincte, cu recomandări specifice fiecăruia. O nouă clasificare a fost prezentată de Lawrence Lenke în 2001, fiind incluse pentru prima dată şi modificările în plan sagital. Deşi clasificarea Lenke este mult mai completă decât cea prezentată de King, este departe de a fi una perfectă. Clasificarea nu cuprinde componenta rotaţională implicată în apariţia scoliozei. Noile tehnologii care permit reconstrucţia tridimensională a coloanei pot servi pentru o clasificare 3D reală a scoliozei şi pentru abordarea unor noi concepte terapeutice.

Scolioza congenitală, ce apare în primele şase săptămâni de viaţă intrauterină poate fi asociată cu malformaţii cardiace sau renale. Malformaţiile vertebrale pot rezulta din fuziunea parţială a corpilor vertebrali. De asemenea în această perioadă se poate dezvolta cifoza congenitală.

Scolioza neuromusculară este asociată cu paralizia cerebrală, distrofia musculară, spina bifida.

Scolioza idiopatică, în care nu poate fi identificată o cauză, se clasifică în funcţie de vârsta pacienţilor.

Trebuie luate în considerare diversele situaţii ce se pot manifesta iniţial ca şi o scolioza: diferenţele de lungime a membrelor inferioare, tumorile osoase, infecţii, scoliozele antalgice. De asemenea, o serie de boli sistemice pot fi asociate cu scolioza: sindromul Marfan, sindromul Klippel-Feil, sindromul Down, osteogeneza imperfectă, neurofibromatoza, sindromul Ehlers-Danlos.

Cuvinte cheie: scolioza, clasificare, scolioze funcţionale, scolioze structurale.

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Introduction

The spine or the axial skeleton represents the central segment of the human locomotor system, a segment that has gained a particular importance with the acquisition of verticality. The spine must support the body in space, resist gravitational forces and all strains from the exterior environment to which it is permanently subjected, and protect the spinal canal content, the spinal cord with its nerve roots. On the other hand, the vertebral column must be sufficiently mobile to allow flexion, extension, rotation and inclination movements of the head and trunk, as well as head motion in space.

The spine must protect nerve tissue, without limiting its own mobility, which is possible due to a complex multisegmental osteoligamentous and muscular structure and to a complicated physiology, which represents an adaptation necessary to the acquisition of the vertical position.

There are many causes that may affect the balance of the spine, preventing the optimal achievement of its functions. Frontal and sagittal plane imbalances occurring in childhood will predominantly worsen in the period of the pubertal growth spurt, until bone maturation. However, there is also the possibility of a slower aggravation throughout adulthood, if these imbalances exceed a certain threshold. Spinal deformities occurring in the adolescent and the adult may cause functional and structural disoders, as well as more or less severe neurological deficits.

Galen defines for the first time scoliosis as being a frontal plane deviation of the spine. Normally, there is no physiological frontal curvature, but the majority of the authors accept a small degree of spinal asymmetry of about 10º. Thus, because of the absence of physiological curvatures in frontal plane, any frontal plane deviation of the spine of more than 10º is considered to be pathological (Antonescu, 2010).

Scoliosis is a deformity of the vertebral column in the three planes, frontal, sagittal and transversal, without the loss of osteoligamentous continuity, which develops over a segment or over the entire length of the spine (Herring & Saunders, 2002).

Classification of scoliosis

A first differentiation should be made between functional scoliosis (scoliotic posture/non-structural scoliosis) and structural scoliosis.

Non-structural or functional scoliosis is transient and can be corrected passively, representing a disturbance of spinal balance in orthostatism, without anatomical changes of the vertebrae or intervertebral discs.

The most frequent causes of functional scoliosis are: lower limb length differences, unilateral paravertebral muscle contracture, torticolis, upper limb asymmetry (Fisher, 2011; Ovadia, 2013).

Stagnara classifies this type of scoliosis into three main categories: *posture defects*, *reducible scoliotic curvatures*, and *compensatory curvatures* (de Mauroy, 2011).

a) Postural defects are scoliotic postures without an obvious cause that occur during childhood; they can be intermittent or permanent, are not accompanied by vertebral rotation, do not evolve into structural scoliosis and disappear during the pubertal growth spurt.

b) Reducible scoliotic curvatures are usually antalgic postures caused by vertebral or juxtavertebral disorders (Bess et al., 2013).

c) Compensatory curvatures develop due to defects located at a distance from the vertebral column, and they can be easily identified through a careful clinical examination: lower limb length differences, inadequate hip postures (stiffness during adduction or abduction of the coxofemoral joint), irreducible muscle retraction.

The objective examination of the locomotor system is particularly important to avoid the misdiagnosis of spinal deviations that could be the onset symptoms of orthopedic or neurological disorders as scoliotic postures and, on the other hand, to avoid overestimating symptomatology and making a diagnosis of structural scoliosis, which might entail the initiation of useless, expensive and long duration orthopedic and/or surgical treatments (Waller et al., 2013).

Structural scoliosis develops in all three spatial planes, due to a lateral inclination, curving and rotation movement of the vertebrae, which maintain their osteoligamentous continuity (Wang, 2012).

The Scoliosis Research Society classifies structural scoliosis as follows:

a) Idiopathic scoliosis represents the most frequent form of structural scoliosis.

Depending on the age at which it develops, idiopathic scoliosis can be divided into:

- infantile scoliosis, between 1-3 years of age, which can be resolutive or progressive;
- juvenile scoliosis, between 4 years of age and the onset of puberty;
- adolescent scoliosis, which develops between the onset of puberty and bone maturation.

Some authors consider that the classification into these three categories is not justified, as the 3 onset ages reflect the different growth rates in childhood and adolescence. The growth rate is higher during early childhood and adolescence and is much lower in the juvenile period. Thus, juvenile scoliosis should not be considered as a separate category (Qiu et al., 2008).

The presence of an important thoracic deformity before the age of 5 years increases the risk of altered pulmonary function and secondarily, cardiac function (cor pulmonale); this is why Dickson opines that idiopathic scoliosis should be divided into two subgroups: early onset scoliosis, between 0 and 5 years, and late onset scoliosis, over 5 years of age. Shufflebarger considers for therapeutic reasons that idiopathic scoliosis should be divided into two categories, early onset scoliosis and late onset scoliosis, but he establishes the delimiting age at 10 years (Wise et al., 2000).

In these children and adolescents, no neurological or muscular disorder is present, and radiographs do not detect congenital or other disease-induced vertebral changes.

b) Neuromuscular scoliosis can be neuropathic or myopathic.

Neuropathic scoliosis can occur through central motor neuron lesions (cerebral palsy, spinocerebellar degenerescence, medullary tumors and trauma, syringomyelia), or through peripheral motor neuron lesions (poliomyelitis, trauma, myelomeningocele).

Myopathic neuromuscular scoliosis occurs in disorders such as: arthrogryposis, Duchenne or Becker muscular dystrophy, congenital hypotonia, dystrophic myotonia etc.

c) Congenital scoliosis is due to formation defects

(cuneiform vertebrae, hemivertebrae), or to segmentation defects (unilateral or bilateral unsegmented bar), or the two can be mixed.

d) Dysmetabolic scoliosis occurs in rickets, osteogenesis imperfecta, juvenile osteoporosis.

e) Scoliosis of infectious cause: spondylodiscitis, Pott's disease

f) Thoracogenic scoliosis: trauma, thoracoplasty, post-burn scars, congenital thoracic deformities.

g) Scoliosis in system diseases: mucopolysaccharidosis, Ehler-Danlos syndrome, Marfan syndrome, von Recklinghausen neurofibromatosis (Al Kaissi et al., 2013).

h) Scoliosis of rare causes: cardiac malformations, osteoid osteoma, genu valgum, concave foot.

i) Tumor scoliosis: brain tumors, spinal tumors, medullary tumors (Schwab et al., 2012).

In approximately 75-80% of the cases, scoliosis is idiopathic, while the rest of 20-25% of the cases are secondary forms.

Anatomo-radiological classification of scoliosis

The Committee of the Scoliosis Research Society defined the types of scoliotic curves depending on the location of the apical vertebra.

A major (primary) curve is a structural curve whose value in degrees is the highest, which is the least reducible curve, with the most important rotation.

Compensatory (secondary) curves are curves that allow the rachis to find its alignment above and below the major curve. They can be non-structural or become structuralized during bone maturation.

An apical vertebra is the most rotated and the most displaced vertebra in relation to the gravity line of the body.

A superior end vertebra is the vertebra at the upper limit of the curve, whose upper end plate has the greatest inclination towards the concavity of the curve.

An inferior end vertebra is the vertebra at the lower limit of the curve, whose lower end plate has the greatest inclination towards the concavity of the curve.

A neutral vertebra is the vertebra at the upper or lower limit of the curve, which is not rotated. It can sometimes be a superior or inferior end vertebra (Newton et al., 2011).

The types of scoliotic curves are (Qiu et al., 2005):

- single high thoracic (cervicothoracic);
- single thoracic;
- single thoracolumbar;
- single lumbar;
- double major thoracic and lumbar;
- double major thoracic;
- double major thoracic and thoracolumbar;
- multiple curves.

The high thoracic curve has its apex at T3 or T4, the superior end vertebra is usually T1 or T2, rarely C7, and the inferior end vertebra is T7. It is usually a left thoracic curve that has a compensatory thoracic or thoracolumbar curve below, which can become structuralized during evolution.

The thoracic curve is one of the most frequent curves and has a marked evolutive potential. The apex is usually situated at T8 or T9, the superior end vertebra is between T4-T6, and the inferior end vertebra is between T11-L2. The most frequent form is T5-T12. 95% of scoliosis cases in adolescents are right thoracic. It is frequently accompanied by a compensatory curve below, which can be quite ample and may generate confusion with double major thoracic and lumbar scoliosis. The right shoulder is elevated, the trunk is deviated to the right and right thoracic gibbosity of variable sizes is present.

The thoracolumbar curve has its apex at T12 or L1, or even at the level of the disc between the vertebrae. The superior end vertebra is between T8-T10, and the inferior end vertebra is usually L3. It can be right or left, with compensatory curves above and below.

The lumbar curve usually has its apex at L2, the end vertebrae between T11-L1 and L4-L5, the majority of the cases being left curves, with compensatory curves above and even below (Schwab et al., 2013).

The double major thoracic and lumbar curve has two curves of similar size and rigidity. The thoracic curve is usually a right curve with the apex in T7 or T8 and the end vertebrae between T4-T6 and T10-T12. The lumbar curve, usually a left curve, has the apex in L2 and extends inferiorly up to L4-L5.

The double major thoracic curve is formed by a high left thoracic curve and a right thoracic curve. The upper curve is short, extending to T5 or T6, while the lower curve extends inferiorly between T11-L2.

The double major thoracic and thoracolumbar curve usually has a right thoracic curve, with the apex at T6 or T7, extending between T4 and T9-T10, and a left thoracolumbar curve, with the apex at the level of the disc between the vertebrae T12 and L1, extending inferiorly to L3.

The presence of multiple curves is usually reduced, aggravation being rare (Potter et al., 2005).

During the course of time, there have been several classifications of scoliosis, the first classification of idiopathic scoliosis being that of King-Moe, which subdivides scoliosis into 5 types depending on the location of the curves (Table I, Fig. 1) (Ovadia, 2013).

Table I

King classification: scoliosis is divided into 5 subgroups according to the main curve and compensatory curve.

Type	Primary curve	Secondary curve	Lateral bending
I	Lumbar, crossing the midline	Thoracic, crossing the midline	Lumbar curve is larger
II	Thoracic, crossing the midline	Lumbar, crossing the midline	Thoracic curve is larger
III	Thoracic	Lumbar, not crossing the midline	–
IV	Long thoracic	Where L5 is centered over the sacrum	–
V	Double thoracic	-	-

(Ovadia, 2013)

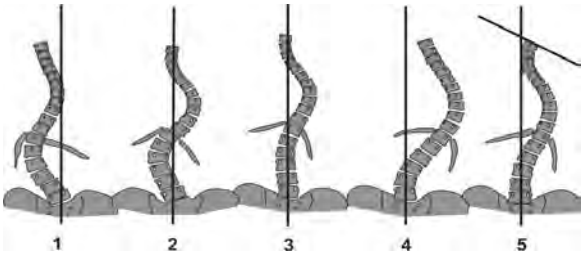

Fig. 1 – King classification (with permission of Ovadia, 2013).

The Lenke classification considers that the structural curve is the major one, and the other two curves are considered as minor, compensatory, the reliability of the classification being 93% compared to only 69% for the King classification (Fig. 2).

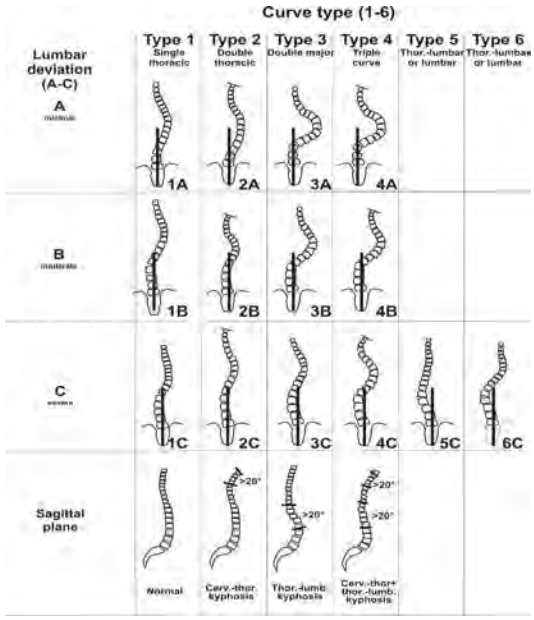

Fig. 2 – Lenke classification (with permission of Ovadia, 2013).

Lenke et al. (2001) estimate the reliability of the classification between 84-90%; also, Ogon et al. (2002) consider the Lenke classification to be more reliable than the King classification. The Lenke classification provides important information about the choice of the type of surgery; scoliosis cases classified as types 1 and 5 can be treated by anterior as well as posterior approach, while for types 2, 3, 4 and 6, only the posterior approach is chosen. Although compared to other classifications it is much more comprehensive and reliable, the Lenke classification is far from being perfect. In approximately 15% of the cases, the surgical treatment chosen does not match the treatment initially proposed by the therapeutic algorithm (Yaman et al., 2014; Niemeyer et al., 2006).

The stereoradiographic measurements of the spinal curves use for analysis the Cobb angle, the apical vertebra, the axial rotation of the apical vertebra and the orientation of the apical vertebra in relation to the sagittal plane.

The new technologies allowing for a three-dimensional reconstruction of the spine can be used for a real 3D classification of scoliosis as a basis for the development of new therapeutic concepts and procedures (Ovadia, 2013).

For establishing an optimal therapeutic approach, the natural history of the scoliotic curve throughout the growth period and at adult age is important. This history refers to the progression of the curve, the frequency of vertebral pain, the possible alteration of pulmonary function, mortality, psychosocial effects, and the influence of pregnancy and delivery on the scoliotic curve.

There are a number of factors correlated with the risk of aggravation of the curve, some related to the patient's growth potential and others related to the particularities of the scoliotic curve: female sex, young onset age of scoliosis, development of scoliosis before the onset of menarche in girls, a low value of the Risser test, a double major curve (the curves with the higher risk of aggravation are represented by the double thoracic curve, the double thoracic and lumbar curve, the single right thoracic curve), a high degree of the curve at the time of diagnosis (Sturm et al., 2010; Weiss et al., 2003).

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Oradea, un centru cu tradiţii şi cu rezultate bune în poloul juvenil din România

Oradea, a Traditional Centre with Good Results for the Romanian Juvenil Water Polo

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Rezumat

În cei aproape nouăzeci de ani de când a fost atestată documentar în Oradea prima echipă de juniori la polo pe apă, prin activitatea depusă şi rezultatele obţinute, oraşul nostru s-a înscris printre cele mai cunoscute centre ale poloului juvenil din România. De-a lungul anilor, echipele de polo din oraşul nostru au pregătit şi au promovat jucători în loturile naţionale de juniori, care au contribuit la obţinerea unor rezultate bune pentru poloul românesc.

Lucrarea se fundamentează pe consultarea unui bogat material documentar, reprezentat de articole de presă, lucrări apărute în reviste de specialitate, în volumele unor manifestări ştiinţifice, informaţii din cărţi, monografii, broşuri, buletine informative şi alte materiale elaborate de federaţia de specialitate, conducerile structurilor sportive locale etc.

Articolul se referă la constituirea şi activitatea echipelor de juniori din Oradea în perioada interbelică, reluarea activităţii după cel de al Doilea Război Mondial, participarea şi rezultatele obţinute în campionatele naţionale în perioada 1955 - 2014. De asemenea, lucrarea abordează contribuţia secţiilor de polo din Oradea la formarea loturilor naţionale de juniori şi rezultatele obţinute în competiţiile internaţionale oficiale.

Cuvinte-cheie: istoria sportului, polo pe apă, juniori.

Abstract

During the ninety years since the first water polo team was first mentioned in Oradea, due to its activity and its results, Oradea is known as one of the most important centers of the juvenile water polo in Romania. The teams from our town have prepared and promoted players in the national team, and they contributed to the good results of the Romanian water polo.

The current paper is founded on a rich documentary material, represented by articles from newspapers, information from books, brochures, documents of the federation as well as from the sport structures in Oradea which had water polo sections.

This article refers to the forming and activity of the junior teams in Oradea during the inter-war period, the resumption of their activity after The Second World War and their results from 1955 to present. This paper also approaches the contribution of the water polo sections of Oradea to the forming of the junior national teams and their results in the official international competitions.

Key words: sport's history, water polo, juniors.

Introducere

Printre sporturile care au început să fie practicate de către orădeni înaintea Primului Război Mondial s-a numărat şi jocul de polo pe apă. Oradea a fost printre primele oraşe din ţara noastră în care s-au constituit echipe de juniori şi s-au organizat competiţii şcolare la polo pe apă. De-a lungul anilor, tinerii poloişti din Oradea au avut comportări bune în competiţiile regionale şi naţionale, au cucerit numeroase titluri de campioni. Secţiile de polo din Oradea au promovat zeci de jucători în echipele reprezentative de juniori ale României, aceştia contribuind la obţinea de rezultate în competiţiile internaţionale oficiale rezervate acestei categorii de vârstă.

Prin performanţele realizate, poloul este jocul sportiv la care echipele din Oradea a obţinut rezultatele cele mai bune. Cu toate acestea, performanţele formaţiilor orădene, activitatea echipelor de la acest nivel nu au fost promovate corespunzător, nu au fost studiate şi nu au apărut articole, monografii etc., care să le facă cunoscute. Având în vedere acestea, am considerat că o lucrare ce să abordeze evoluţia poloului juvenil din Oradea, rezultatele echipelor de juniori în competiţiile naţionale, contribuţia lor la formarea loturilor reprezentative ale României este de actualitate şi prezintă interes pentru cei care studiază istoria sportului orădean.

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Constituirea primelor echipe de juniori şi activitatea lor în perioada interbelică

De la prima atestare documentară a practicării jocului de polo în Oradea au trecut aproape cincisprezece ani până când s-a constituit, în mod oficial, cea de întâi echipă de juniori la această disciplină sportivă (Tőrők, 1937). În a doua jumătate a anilor 1920, la Oradea, erau mai multe echipe de polo, Stăruinţa, Clubul Athletic, Asociaţia Sportivă, Înţelegerea, Maccabi (Goina şi Maroti, 2012). Sporirea numărului tinerilor care practicau jocul de polo, creşterea numărului echipelor care activau în cadrul unităţilor sportive din localitate au determinat conducerile acestora să se preocupe de înfiinţarea unor echipe de juniori, care să contribuie la promovarea acestei discipline sportive în rândul tinerilor, în mediul şcolar, să asigure formarea unor jucători care să ducă mai departe tradiţia acestui joc sportiv.

Prima echipă de polo alcătuită din juniori s-a constituit, în anul 1926, în cadrul secţiei de la Asociaţia Sportivă Oradea (***, 1926). La mai puţin de un an de la acest eveniment, presa locală relata despre primul joc de polo la care a participat echipa de juniori a Asociaţiei Sportive Oradea (***, 1927c). În acest prim an de existenţă, echipa a jucat mai multe meciuri cu echipa de seniori de la Asociaţia Săportivă Oradea (***, 1927a), cu formaţia de old-boy (***, 1927b).

În anul 1928, în organizarea profesorilor de educaţie fizică, Lehocky şi Péter, s-a derulat o competiţie cu participarea reprezentativelor Liceului Kecskeméti Lipot şi Liceul Gábor Áron (***, 1928 c). În acest fel, Oradea s-a numărat printre primele oraşele din România în care s-au organizat jocuri de polo între echipe reprezentative şcolare.

În anul 1928, la 30 iunie, s-a consemnat primul joc al unei echipe de polo, juniori, în care tinerii jucători din Oradea s-a întrecut cu o formaţie similară din alt oraş, Clubul Athletic Cluj (***, 1928b). Popularitatea, amploarea pe care a luat-o jocul de în rândul tinerilor orădeni şi sprijinul de care se bucura acest sport sunt evidenţiate de faptul că redacţia ziarului Nagyvárad a realizat o acţiune de promovare a acestui sport şi a organizat Cupa Nagyvárad (***, 1928a).

Începând cu vara anului 1931, în urma înţelegerilor dintre guvernul României şi cel al Ungariei privind facilitarea legăturilor sportive bilaterale, după deciziile luate de miniştrii de interne din celor două ţări pentru înlesnirea vizelor acordate în vederea participării la competiţiile sportive, s-au diversificat legăturile între structurile sportive şi au crescut numărul întâlnirilor între sportivii din cele două ţări (Jakobovics, 1931). Astfel, începând cu luna iulie 1931, întâlnirile dintre echipele de polo din Oradea şi cele din Debrecen au devenit fecvente, ceea ce a fost în beneficiul ambelor părţi.

Prin jocurile demonstrative susţinute, prin participarea la o serie de competiţii opficiale locale şi regionale, echipele de polo juniori au contribuit la promovarea aestui sport în rândul tinerilor şi al locuitorilor oraşului, la dezvoltarea acestei discipline sportive (***, 1935).

Între anii 1940 şi 1944, chiar dacă la Oradea nu s-au dat lupte armate, calendarul competiţiilor sportive s-a diminuat mult, iar activitatea organizată a echipelor de polo juniori s-a întrerupt (Pásztai ş. c., 2011).

Reluarea activităţii şi primele participări în campionatul republican al juniorilor

După cel de al Doilea Război Mondial, cu tot entuziasmul care domnea în rândul iubitorilor sportului din oraş şi popularitatea de care se bucura jocul de polo în rândul tinerilor şi elevilor orădeni, problemele organizatorice, greutăţile de natură financiară, lipsa de interes şi sprijinul insuficient din partea conducătorilor sportului local, au determinat ca Oradea să nu se numere printre oraşele ale căror echipe au participat la primele ediţii ale Campionatului Republican de Juniori (Demjén, 1996).

După evoluţia foarte slabă a echipei de seniori în campionatul 1952 şi retrogradarea din prima divizie a echipei Constructorul, în anul 1953, tot mai mulţi conducători ai sportului orădean şi ai secţiilor de polo din localitate au înţeles că dezvoltarea acestui sport în Oradea, formarea unei baze de masă care să conducă la formarea unei echipe care să facă faţă cu cinste în Campiuonatul Republican divizia A, trebuie să înceapă de la selecţia, pregătirea şi promovarea juniorilor (***, 1955b)

Dorinţa de a lucra cu tinerii, priceperea de care a dat dovadă şi prestigiul de care se bucura antrenorul Sonnenwirth Miklos, au fost factori care au condus la constituirea unei grupe de juniori în cadrul Colectivului Sportiv de la Voinţa Oradea (***, 1955a). Munca depusă, modul în care a realizt selecţia, iscusinţa cu care a condus pregătirea tinerilor jucători au început să dea roade începând din anul competiţional 1956, când echipa a ocupat locul trei la faza de zonă. În următorii doi ani echipa Asociaţiei Sportive Voinţa Oradea s-a calificat la turneele finale ale Campionatului Republican al Juniorilor (***, 1959).

1968. Echipa de juniori a Clubului Sportiv Crişul Oradea. Rândul de sus: Stănescu Sorin, Drăgan Ioan, Tileagă Octavian, Stăneguţă Mircea, Şandor Bebe, Stănescu Radu, Moruzi Mihai, Costrăş Dorin, Kovacs. Rândul de jos: Davidescu Mihai, Hütner István, Gui Vasile (Sursa: albumul Mihai Moruzi)

În anii următori, ca urmare a procesului de pregătire la care au participat, juniorii orădeni au progresat, au crescut valoric, iar în competiţiile la care au luat parte alături de cele mai bune echipe din ţară, au acumulat o bogată experienţă competiţională. Activitatea şi rezultatele echipelor de juniori din localitate au cunoscut o îmbunătăţire odată cu constituirea Clubului Sportiv Oradea şi coordonarea acestei activităţi de către antrenorul Freund Emerich. Chiar dacă între 1959 şi 1967 nu s-au obţinut rezultate deosebite, prin

munca antrenorilor Sonnenwirth Miklos, Filip Gheorghe, Lévai Pál şi Pécsy Laszló, s-au format echipe care au reuşit calificarea la turneele finale, Voinţa în 1959, 1961, 1962 şi 1963, (***, 1964) Crişul în 1964 şi 1967, Rapid în 1965 şi 1966, formarea unor tineri jucători valoroşi, promovarea lui Lengyel Béla, Harabula Andrei şi Stănescu Sorin în reprezentativa de juniori a României (***, 1969).

Ani de afirmare pe plan naţional

Prevederile Legii Educaţiei Fizice şi Sportului, adoptată în anul 1967 (***, 1967), situaţia în care se găsea poloul orădean la aceea dată, au deterimiat factorii de conducere ai sportului local şi pe cei ai secţiilor de natație să ia o serie de măsuri pentru realizarea unei structuri organizatorice care să asigure un raport optim între echipele de seniori şi grupele de copii şi juniori, acordarea unui rol major selecţiei, pregătirii şi promovării tinerilor talentaţi (***, 1969). Pornind de la aceste realităţi, antrenorii orădeni, având sprijinul secţiilor de natație din localitate, în colaborare cu unităţile de învăţământ, au efectuat o acţiune de selecţie în şcolile din localitate în vederea constituirii unor grupe de polo care să formeze baza unei viitoare echipe, având drept obiectiv ca, după cinci-şase ani, să se califice la turneul final şi să se claseze pe un loc fruntaş în Campionatul Republican al Juniorilor I.

1978. Crişul Oradea, echipa campioană la juniori I. Rândul de sus: Rada Mihai, Pantea Roberto, Costrăş Dorin, Rujinschi Nicolae (antrenor) Karácsonyi István, Mikás Tibor, Sücs László. Rândul de jos: X, Illés Zoltán, Csáki István, Boros Peti, X (Sursa: albumul Dorin Costrăş).

Rezultatele obţinute în această perioadă la etapele de zonă şi turneele finale, pentru mulţi erau semne că poloul juvenil din Oradea era pe un drum bun, că echipele dispuneau de resurse umane valoroase şi că, într-un timp scurt, Oradea va deveni unul din centrele de juniori puternice ale acestei discipline sportive din România. Calitatea selecţiei şi a pregătirii asigurate la nivelul echipelor de juniori, munca desfăşrată de antrenori, în mod deosebit de cei de la Clubul Sportiv Crişul, Rujinschi Nicolae şi Lévai Pál, a fost confirmată în anii 1973 şi 1978, când echipa acestei structuri sportive a devenit campioană naţională la juniori mari (***, 2011b). Celelalte clasări pe podiumul turneelor finale de juniori din aceşti ani au confirmat valoarea poloului juvenil din Oradea. În această perioadă Fejér Iván, Rácz Petru, Freund Roland, Rada Mihai, Costrăş Dorin, Gordan Cornel au fost cei mai reprezentativi jucători de polo juniori din Oradea care au făcut parte din loturile naţionale de juniori ale României (***, 2011a).

Perioada 1980 - 1990

Greutăţile cu care s-a confruntat sportul în anii 80, criza de antrenori la nivelul copiilor şi juniorilor în cadrul echipelor de polo orădene şi-au pus amprenta asupra activităţii şi a rezultatelor obţinute la acest nivel.

Faptul că în această perioadă eforturile s-au axat, cu preponderenţă, pe spijinirea secţiei de seniori de la Crişul Oradea şi că echipele de juniori nu au avut condiţii corespunzătoare, au condus la restrângerea activităţii la acest nivel, la regresul performanţelor obţinute. Această stare de lucruri este oglindită de faptul că în deceniul nouă echipele orădene au reuşit doar trei clasări pe podiumul campionatelor naţionale, un loc trei la juniori I, în 1989, şi două locuri doi la juniori II, în 1980 şi 1987. În aceşti ani, din rândul componenţilor echipei Crişul Oradea au fost promovaţi în lotul naţional de juniori mai mulţi jucători. Dintre aceştia cei mai reprezentativi fiind Pantea Roberto, Illés Zoltán, Kiss Francisc, Csáki István, Kagan Vladimir şi Bonca Florin. De asemenea, s-au format şi alţi juniori valoroşi, Indig László, Indig Gábor, Mészáros László, Hegyesi László, Sălăjan Mercel, Oros Felix, Toth Francisc, Sztankovitz Alexandru, Codilă Dan şi Pop Cristian, care au fost promovaţi în echipa de seniori, unde s-au integrat şi au contribuit la cucerirea a două titluri de campioni, la cinci clasări pe locul secund şi trei locuri trei în campionatul republican de seniori (***, 1989).

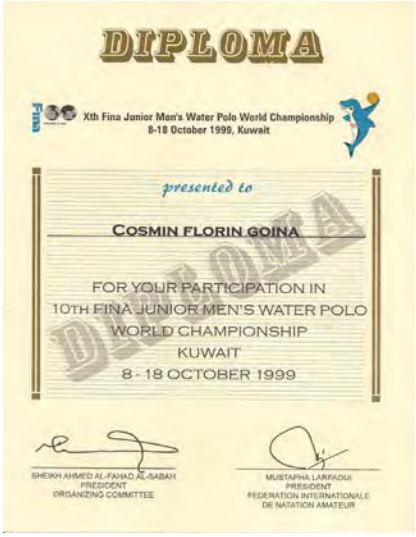
Perioada dominării orădene pe plan naţional

La începutul anilor 1990, spre deosebire de conducătorii majorităţii structurilor sportive din Oradea, cei care erau în fruntea echipelor de polo au înţeles evoluţia evenimentelor în noile condiţii, implicaţiile acestora asupra sportului, s-au adaptat mai repede noii situaţii, au avut capacitatea de a lua, de cele mai multe ori, decizii care s-au dovedit corecte, asigurând stabilitate la nivelul secţiilor, o bună finanţare, condiţii de pregătire şi participare în competiţii. Schimbările produse în sportul românesc după evenimentele din 1989, la nivelul poloului orădean au produs o schimbare a strategiei. Conştienţi de faptul că poloul orădean se poate întări şi face faţă în condiţiile crizei de jucători şi deficitului de finanţare doar bazându-se pe elementele autohtone, la iniţiativa şi sub conducerea preşedintelui Clubului Sportiv Crişul, Alexandrescu Ioan, s-a elaborat o strategie în care selecţia, pregătirea şi promovarea copiilor şi juniorilor a ocupat un loc important (***, 1993).

Poloul orădean a avut şansa ca în ultimii douăzeci de ani să beneficieze de generaţii de jucători talentaţi, antrenori pricepuţi şi condiţii materiale deosebite. Aceşti jucători, s-au afirmat, pe de o parte, datorită talentului şi muncii lor, dar şi primilor lor antrenori, Băjenaru Eugen, Cosma Marcel, Orbán Zoltán, Cîmpianu Ciprian, Sava Dorin şi Goina Cosmin. Aceşti specialişti cu vocaţie au condus pregătirea şi participarea în competiţii a echipelor de juniori orădene, punându-şi cu pricepere în valoare cunoştinţele şi experienţa, valorificând optim calităţile jucătorilor, formând colective valoroase care s-au impus la nivel naţional. Prin modul în care şi-au exercitat profesia,

prin felul în care au călăuzit destinele multor generaţii de poloişti merită cu prisosinţă aprecierea şi stima noastră.

În ultimele două decenii, echipele orădene au cucerit zece titluri de campioni naţionali, un loc doi şi trei locuri trei la juniori I. Cele şaisprezece medalii, şapte de aur, şase de argint şi trei de bronz, cucerite la turneele finale ale Campionatelor Naţionale de Juniori II, oglindesc şi ele valoarea ridicată a poloului juvenil din Oradea. De asemenea, în acest interval de timp, echipele de juniori III din Oradea au realizat nouăsprezece clasări pe podiumul campionatelor naţionale. În cele cincisprezece ediţii, rezultate bune s-au obţinut şi la Cupa Federaţiei de Polo, Copii, cinci locuri unu, două locuri doi şi două locuri trei (***, 2011b).


DIPLOMA

Xth Fina Junior Men's Water Polo World Championship
8-18 October 1999, Kuwait

presented to

COSMIN FLORIN GOINA

FOR YOUR PARTICIPATION IN
10TH FINA JUNIOR MEN'S WATER POLO
WORLD CHAMPIONSHIP
KUWAIT
8 - 18 OCTOBER 1999

SHEIKH AHMED AL-FAHAD AL-SABAH
PRESIDENT
ORGANIZING COMMITTEE

MUSTAPHA LARFAOUI
PRESIDENT
FEDERATION INTERNATIONALE
DE NATATION AMATEUR

Diplomă de participant la turneul final al celei de a X-a ediţii a Campionatului Mondial de Juniori, 8 - 18 octombrie 1999, Kuwait (Sursa: albumul Goina Cosmin)

De asemenea, sunt de apreciat contribuţiile echipelor din Oradea la formarea loturilor naţionale de juniori ale României şi participarea acestora în competiţiile internaţionale oficiale rezervate acestei categorii de vârstă. Între 1978 şi 2013 secţiiile de polo din Oradea au promovat peste treizeci de jucători în echipele reprezentative de juniori ale României, Costrăş Dorin, Sălăgean Marcel, Illés Zoltán, Pantea Roberto, Kiss Francisc, Csáki István, Kagan Vladimir, Ţic Bogdan, Goina Cosmin, Diaconu Nicolae, Kádár Kálmán, Rydzyk Zoltán, Pop Roland, Alexa Cătălin, Sferle Alexandru, Paleacu Bogdan, Mălai Mircea, Dunca Gheorghe, Sandor Cristian, Baidoc Cosmin, Şarba Ciprian, Tomescu Ovidiu, Domocoş Rareş, Târtea Călin, Georgescu Ramiro, Tarnoveţchi George, Cîmpianu Bogdan, Popoviciu Alexandru, Creţu Andrei, Ţic Marius. Jucători din Oradea au participat la două ediţii ale Campionatelor Mondiale de Juniori, Kuwait, 1999, Perth, 2013, şi douăzeci şi una de ediţii ale Campionatelor Europene de Juniori, Budapesta 1978, Sitard 1980, Varna 1982, Istabul 1984, Berlin 1986, Sopron 1992, Vaenendal 1993, Bratislava 1994, Esslinge 1995, Istambul 1996, Maribor 1997, Bratislava 1998, Lunen 2000, Sofia 2005, Oradea 2006, La Valetta 2007, Chania 2009, Rijeka 2011, Canet En Roussion 2012 (***, 2014).

Concluzii

1. Oradea s-a numărat printre primele oraşe din România în care s-au constituit echipe de juniori şi s-au disputat întreceri şcolare la polo pe apă.

2. Între anii 1926 şi 1940, prin numărul echipelor de juniori care activau în localitate, prin competiţiile organizate şi prin rezultatele obţinute pe plan local şi regional, Oradea, alături de Cluj, Timişoara, Târgu Mureş şi Bucureşti, era unul dintre cele mai cunoscute centre ale poloului juvenil din România.

3. După ce în anii `50 şi `60 s-au pus bazele selecţiei, pregătirii şi promovării juniorilor, în deceniul opt al secolului trecut, prin titlurile de campioni naţionali obţinute de Crişul, în 1973 şi 1978, Oradea s-a impus, după Bucureşti, ca cel de al doilea centru de copii şi juniori al ţării la polo pe apă.

4. În ultimele douăzeci şi cinci de ediţii ale campionatului naţional, echipele orădene s-au clasat de cincizeci şi două de ori pe podiumul turneelor finale ale juniorilor, dintre care de zece ori pe locul unu la juniori I, de şapte ori pe locul unu la juniori II şi de zece ori pe locul unu la juniori III.

5. De-a lungul anilor, din rândul echipelor de polo orădene au fost promovaţi un mare număr de jucători în loturile reprezentative de juniori ale României. Numai între anii 1978 şi 2013, peste treizeci de tineri jucători orădeni au fost componenţi ai echipelor naţionale de juniori care au participat la două campionate mondiale şi douăzeci şi una de ediţii ale campionatelor continentale de juniori.

Conflicte de interese

Nu sunt.

Precizări

Lucrarea a fost realizată pe baza datelor obţinute în cadrul procesului de documentare în vederea elaborării unei monografii a poloului orădean.

Pentru sprijinul primit, adresăm mulţumirile noastre tuturor celor care ne-au pus la dispoziţie informaţii, fotografii, alte documente privind istoria jocului de polo în Oradea. De asemenea, aducem mulţumiri salariaţilor Clubului Sportiv Crişul Oradea, Clubului Sportiv Municipal Oradea şi personalului de specialitate de la Biblioteca „Gheorghe Şincai" din Oradea, Direcţia Judeţeană Bihor a Arhivelor Naţionale ale României.

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RECENT PUBLICATIONS
ACTUALITĂŢI EDITORIALE

New Romanian publications in the field of sports
Publicaţii româneşti recente în domeniul sportului

Metodica predării Educaţiei Fizice şi Sportului (ediţia a II-a)
Elena Lupu
Editura Institutul European, Iaşi, 2012
136 pagini

Metodica predării Educaţiei Fizice şi Sportului este o carte care se adresează studenţilor în special, dar totodată şi profesorilor şi altor specialişti din domeniul sport şi ştiinţele educaţiei. În capitolul *Metode şi orientări metodologice moderne utilizate în activitatea de educaţie fizică şi sport* puteţi găsi informaţie bogată în ce priveşte aspectele de psihomotricitate, punând în evidenţă noi programe şi metode educaţionale din domeniul educaţiei fizice, sportive, psihomotorii. La sfârşitul fiecărui capitol sunt prezentate teste de autoevaluare şi teme de verificare, utile pentru, o bază completă de informare..

Excelenţa aptitudinală în sportul românesc
Ileana Monica Popovici
Editura Universităţii „Alexandru Ioan Cuza" din Iaşi, 2014
200 pagini

În cartea *Excelenţa aptitudinală în sportul românesc*, Ileana Monica Popovici prezintă un subiect puţin abordat în literatura de specialitate şi anume talentul sportiv.

În capitolele cărţi sunt tratate teme din motricitatea umană ca formă de manifestare a excelenţei aptitudinale, factorii care determină talentul sportiv, stresul, anxietatea şi autocontrolul la sportivii de înaltă performanţă. Talentul sportiv este prezentat atât din perspectivă teoretică, cât şi practică. Cartea merită citită pentru că oferă căi şi mijloace de identificare a talentelor sportive. Aceasta se adresează în special profesorilor şi antrenorilor care se ocupă de „cultivarea" talentului în înalta performanţă.

Fitness pentru educaţia corporală a studentelor
Dumitrescu Remus
Editura Universităţii din Bucureşti, 2013
186 pagini

Fitness-ul este un concept care are multiple înţelesuri, în funcţie de nivelul cultural şi formaţia profesională a celui ce îl utilizează. Fitness-ul este capacitatea de a accede la o calitate optimă a vieţii, reprezintă deci o condiţie dinamică, multidimensională ce se bazează pe o stare de sănătate pozitivă şi include mai multe componente: fitness intelectual, social, spiritual şi fizic (condiţia fizică).

Autorul Remus Dumitrescu, abordează o temă larg dezbătută şi la modă în ziua de astăzi. Cu toate acestea este un curs ce aduce noutăţi în acest domeniu, în care exerciţiul fizic devine un instrument flexibil pentru atingerea obiectivelor de dezvoltare structural - funcţională, care se adresează studentelor. În ciuda faptului că este destinată studentelor şi studenţii pot folosii exerciţiile recomandate în menţinerea unui corp frumos şi a unei stări de sănătate la parametrii optimi. Un potenţial biomotric crescut conduce la o stare optimă de sănătate.

Activităţile corporale - calea spre o sănătate mai bună
Mihaela Ganciu, Oana Maria Ganciu
Editura Universităţii din Bucureşti, 2014
350 pagini

Activităţile corporale se prezintă sub o multitudine de forme, atât ca structuri motrice, cât şi ca particularităţi funcţionale, asigurând nevoile vitale ale creşterii şi dezvoltării fiinţei umane în plan biologic, psihologic şi social. Aceste activităţi trebuie să dezvolte, să formeze, să prevină, să compenseze şi să corecteze disfuncţiile, acolo unde condiţiile de viaţă, de muncă şi activitatea socială nu reuşesc să păstreze echilibrul vieţii umane. Autoarele reamintesc studenţilor şi altor categorii de tineri, că starea de bine şi sănătatea depinde de fiecare în parte şi faptul că stă la îndemâna fiecăruia să practice aceste activităţi, dintre care amintim câteva: gimnastica, fitness-ul, înotul, turismul, mersul pe bicicletă etc. Aşadar, ca o concluzie nu ezitaţi, citiţi cartea, dar folosiţi ce aţi citit şi în practică.

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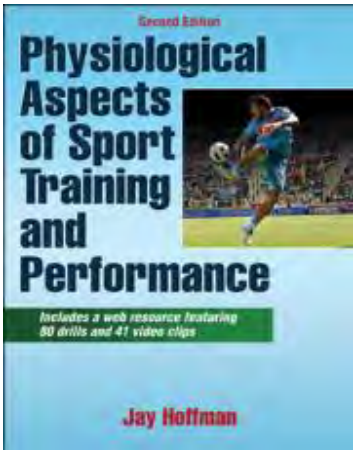
Palestrica Mileniului III – Civilizaţie şi Sport
Vol. 15, no. 4, Octombrie-Decembrie 2014, 363–366

Book reviews
Recenzii cărţi

Physiological Aspects of Sport Training and Performance With Web Resource 2nd Edition
(Aspecte fiziologice privind antrenamentul şi performanţa sportivă cu resurse web, ediţia a 2-a)
Autor: Jay Hoffman
Editura: Human Kinetics, august 2014
520 pagini; Preţ: £ 60.99



520 pagini (cu aproape 170 mai mult decât în ediţia din 2002), 5 părţi, 27 capitole, şi totuşi un singur autor – dar nu orice autor, ci directorul Insitutului de Fiziologie a Efortului Fizic şi Wellness-ului, din cadrul Universităţii Floridei Centrale – iată datele cifrice reci şi seci, însă suficient de concludente pentru a stârni tot interesul, faţă de această foarte recentă şi actuală reeditare, de la editura Human Kinetics. Convertite în text, cifrele menţionate mai sus înseamnă - inclusiv din punct de vedere fizic, material vorbind - un consistent volum, care se adresează practic tuturor specialiştilor, actuali sau în formare, a căror îndeletnicire-misiune este aceea de a-i învăţa-îndruma şi superviza pe cei care fac sport, nu contează dacă pentru sănătate ori de performanţă, adică pentru titluri şi medalii.

Prescrierea efortului fizic şi adaptările pe care ea le ţinteşte şi generează, reprezintă astăzi teritorii ştiinţifice şi practice nu doar extrem de vaste, ci şi în continuă expansiune, ale căror fundamente, amănunte şi noutăţi este minunat să le găseşti explicate şi exemplificate unitar, precis şi foarte accesibil, într-o singură lucrare; din aceste puncte de vedere meritele cărţii de care ne ocupăm fiind cât se poate de evidente. Merite foarte greu, dacă nu imposibil, de atins de către o asemenea încercare, în condiţiile abordării unui număr extensiv de teme, subiecte şi concepte - de la influenţa ambianţei asupra performanţelor fizice, la problemele fundamentale şi specifice ale nutriţiei şi hidratării, în diverse condiţii şi contexte, de la raţiunea, eficienţa, utilitatea şi modul de utilizare al suplimentelor sportive, la supraantrenament, de la ştiinţa şi practica încălzirii în sport, la testările specifice diverselor discipline sportive etc, etc - dacă, pe lângă îndeletnicirile de profesor universitar la o valoroasă universitate americană şi cercetător, autorul nu le-ar fi trăit-experimentat şi pe cele de sportiv şi antrenor de performanţă.

Aşa cum am precizat deja, dacă eliminăm paginile acoperite cu bibliografia şi indexul atât de util şi complet, structura „macro" a textului propriu-zis al cărţii (446 pagini) ne propune 5 părţi. Cumva de aşteptat, prima dintre ele este dedicată „adaptărilor fiziologice induse de efortul fizic", practic modificărilor mai mult sau mai puţin evidente-vizibile, pe care diversele tipuri şi variante de antrenament le generează în plan biochimic, hormonal, muscular, cardiovascular şi respirator, nervos şi imunologic. Ea este urmată de cele 11 capitole şi 180 de pagini (cele mai multe), ale secţiunii în care sunt prezentate, explicate şi exemplificate „principiile antrenamentului şi prescripţia efortului fizic", după care vine partea despre „alimentaţie, reglarea lichidiană şi suplimentarea nutriţională". „Factorii ambientali" este intitulată penultima parte, care se ocupă desigur de particularităţile reacţiei organismului şi de recomandările de care trebuie să se ţină cont, în cazul prestării de efort fizic în condiţii de temperatură ridicată, respectiv scăzută, şi de altitudine. Pentru ca în final, sub titlul „condiţiile medicale şi de sănătate" să fie tratate problemele supraantrenamentului şi ale efortului fizic în relaţie cu diabetul, respectiv ale bronhospasmului indus de efort şi ale morţii subite în sport.

În ideea de a-i antrena-angrena pe cititorii acestei prezentări să se implice activ în aflarea cât mai multor detalii despre această indiscutabil valoroasă şi foarte binevenită lucrare, renunţăm la a le mai „servi pe tavă" şi alte informaţii referitoare la conţinutul său. Vom reţine totuşi aici faptul că privitor la structura „micro", adică la titlurile capitolelor şi subcapitolelor, şi la alte amănunte, cei interesaţi se pot edifica complet accesând site-ul http://www.humankinetics.com/ProductSearchInside?Login=Done&isbn=9781450442244. Semnalăm totodată şi faptul că, la acelaşi link, doritorii au posibilitatea de a lectura gratuit, un număr de pagini, care conţin informaţii şi cunoştinţe utile, pe care nu au posibilitatea de a şi le procura din alte părţi. Este cazul, spre exemplu, cu primele două capitole - *Sistemul muscular şi efortul fizic* şi *Sistemul endocrin şi efortul fizic* - din care nu lipsesc decât bibliografiile. Pe alte site-uri pot fi lecturate două scurte, dar foarte interesante şi actuale materiale: primul abordează răspunsul imunitar la sportivi care, uneori (în cazul eforturilor foarte solicitante, cum ar fi cele din maraton şi ultramaraton), poate căpăta conotaţii negative/nefavorabile pentru sănătatea şi rezistenţa organismului faţă de viruşi şi microbi (http://www.humankinetics.com/excerpts/excerpts/athletes-experience-health-benefits-of-training-with-some-risk), iar celălalt se ocupă de utilizarea suplimentelor, în scopul stimulării sintezei proteinelor contractile musculare, oferindu-ne o edificatoare comparaţie între cazeină şi proteinele din zer (http://www.humankinetics.com/excerpts/excerpts/supplementation-in-stimulating-muscle-protein-synthesis).

În încheiere mai menţionăm că atât pentru cei aflaţi în faza de formare profesională - studenţi şi masteranzi - cât, de fapt, şi pentru oricine altcineva, dacă vrea să rămână cu ceva în minte după lecturarea-studierea completă sau parţială a cărţii, fiecare capitol debutează cu o trecere în revistă a aspectelor cheie pe care le va aborda, şi se finalizează printr-un set de întrebări recapitulative, cu ajutorul căruia se poate realiza evaluarea sau autoevaluarea nivelului de însuşire a materialului parcurs. Pe de altă parte, pentru a face mai uşoară utilizarea în practica sportivă de zi cu zi a celor conţinute-propuse, cartea vine cu o nouă bază de resurse web, constând în 80 de programe de antrenament în format pdf, care pot fi printate şi înmânate sportivilor. Majoritatea acestor planuri de antrenament sunt prevăzute cu cel puţin o fotografie, în care se arată cum se execută una dintre mişcările cheie ale lecţiei în cauză, iar 41 dintre ele sunt prezentate sub forma unor demonstraţii înregistrate video, accesibile online, care conţin şi o secvenţă de încălzire, compusă din 10 exerciţii dinamice, atent şi fundamentat alese, în aşa fel încât să se ţină seamă atât de conţinutul şi specificul părţii fundamentale, cât şi de anumite caracteristici-particularităţi ale sportivilor cărora li se adresează.

Gheorghe Dumitru
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Stil de viaţă, nu dietă
(No diet, style of life)
Autor: Valentin Vasile
Editura: Curtea Veche Publishing, Bucureşti, 2014
172 pagini

În viaţa cotidiană omul, căutând să-şi facă viaţa cât mai uşoară şi plăcută, conştient sau inconştient devine tot mai sedentar. De secole, obiceiurile alimentare în linii mari se menţin, iar efortul fizic este tot mai scăzut. Făcându-şi viaţa mai comodă, omul modern nu realizează că dăunează grav întregului său organism atât calităţilor sale fizice, cât şi intelectuale. Abia când situaţia s-a agravat în ultimele decenii, în urma rezultatelor neplăcute ale degradării stării sale de sănătate, mulţi autori, în diferite moduri, au început să atragă atenţia asupra urmărilor negative asupra organismului a alimentaţiei nesănătoase şi necoroborate cu efortul fizic al fiecărui individ.

Cartea lui Valentin Vasile *Stil de viaţă nu dietă* relevă pasiunea autorului pentru starea de sănătate în general şi în mod deosebit pentru armonia corpului uman, realizate prin exerciţiu fizic şi în special prin alimentaţia sănătoasă.

Tânărul autor a petrecut peste zece ani în sălile de sport în calitate de antrenor sau antrenor personal calitate în care a dobândit o vastă experienţă în domeniu. Pe baza cunoştinţelor teoretice şi practice acumulate, a susţinut o serie de examene de acreditare la nivel internaţional ca specialist în nutriţie.

Lucrarea este o pledoarie pentru optimizarea stilului de viaţă versus dietă, pentru a slăbi, a-şi forma un corp sănătos, frumos şi o viaţă echilibrată. Cartea se adresează persoanelor care nu au cunoştinţe de nutriţie. Accentul se pune pe o alimentaţie fundamentată pe criterii ştiinţifice, admiţând totodată că fiecare obicei alimentar pe care vrem să-l introducem în noul stil de viaţă, poate fi educat sau exersat.

Autorul prezintă într-o manieră exactă proprietăţile alimentelor, cantităţile în care acestea ar trebui consumate, asocierile care se pot face între felurite produse alimentare, precum si combinaţiile care trebuie evitate.

În lucrarea analizată se remarcă faptul că alimentaţia raţională nu implică un stil de viaţă lipsit de orice formă de plăcere culinară. În noul stil de viaţă totul trebuie să fie făcut cu măsură, în care totuşi să redescoperim plăcerea de a lua masa în familie, să savurăm îndelung mâncarea înainte de a o înghiţi, în care să mâncăm pentru a ne satisface nevoile corpului şi nevoile emoţionale.

Cele şase capitole ale lucrării reuşesc să convingă cititorul de necesitatea schimbării obiceiurilor de nutriţie.

Chestionarul introdus în capitolul II are menirea să convingă cititorul de a se adânci în problematica nutriţiei sănătoase.

Odată formate aceste convingeri autorul prezintă cinci paşi de urmat în vederea slăbirii sănătoase şi definitive.

Prezentarea detaliată şi bine argumentată a celor zece legi, care trebuie să fie respectate pentru a se menţine suplu şi sănătos, convinge cititorul de principiile, treptele şi posibilităţile care stau la baza stabilirii unei alimentaţii sănătoase.

Lucrarea are un capitol special dedicat alimentaţiei femeii însărcinate. Alt capitol se referă la îmbunătăţirea vieţii sexuale cu ajutorul alimentaţiei sănătoase.

Autorul atrage totodată atenţia asupra necesităţii corelării alimentaţiei sănătoase cu mişcarea de orice fel, fapt care trebuie să constituie de asemenea o preocupare inevitabilă a unui stil de viaţă sănătos.

Aş recomanda autorului să facă şi legătura cu consumul de calorii/kg. Corp, în funcţie de efortul efectuat, aşa cum este scris în orice curs de igienă (cap. Alimentaţie), al oricărei universităţi de medicină sau facultăţi de educaţie fizică.

Bibliografia prestigioasă, conţine lucrări din ţară şi străinătate şi asigură un nivel ştiinţific corespunzător.

Cartea este recomandată tuturor celor interesaţi de o viaţă sănătoasă, indiferent de nivelul acestora de pregătire şi dezvoltare fizică.

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Ioan Lador între excelenţa umană şi arenele universitare

(Ioan Lador between human excellence and academic arenas - review)

Autor: Ilie Dobre

Editura: Paralela 45, Piteşti, 2014

207 pagini

Cartea *Ioan Lador între excelenţa umană şi arenele universitare* face parte din categoria publicaţiilor memorialistice scrise la finalul carierei unui om, care a reuşit în viaţă o remarcabilă ascensiune profesională.

Autorul acestui volum, Ilie Dobre, crainicul vivace al transmisiunilor fotbalistice prezintă activitatea profesională a concitadinului meu Ioan Lador ca pe o întreagă echipă preferată, pe care o însoţeşte la etapele campionatului numit viaţă.

Componenţa echipei editurii *Paralela 45*, care a publicat cele 207 pagini ale volumului are următoarea componenţă: editor Călin Vasile; tehnoredactor Adriana Vlădescu; coperta Ionuţ Broştianu; prepress Marius Badea.

Din cele 35 de subtitluri care alcătuiesc cuprinsul cărţii le-am considerat mai semnificative pe următoarele: În reflectorul biografic, În dribling printre amintirile copilăriei, Examenul de admitere la IEFS Bucureşti, Şef peste colegi în anii studenţiei, Asaltul redutelor universitare, Frumoasa cu ochi albastri sau trofeul cel mai de preţ, Inspector în minister.

Urmează o admirabilă şi incitantă înşiruire a tuturor competiţiilor universitare la care a participat inspectorul universitar, pe întreaga planetă.

Ultima parte a consemnărilor mai cuprinde 16 aprecieri laudative din partea unor personalităţi didactice, opt acreditări la mari competiţii internaţionale şi diplome, 39 poze de familie şi din diverse deplasări sau întâlniri.

La finalul volumului autorul îşi prezintă o listă a lucrărilor, iar pe coperta a 4-a, în acelaşi stil etalează, capturile onorifice de care a beneficiat pe parcursul carierei.

Lucrarea incită la o întrebare, ca o provocare pentru alt volum în care să prezinte zbuciumul şi greutăţile pe care s-au aglutinat marile realizări profesionale ale profesorului pornit din Dejul în care se întoarce doar cartea, ca o amintire.

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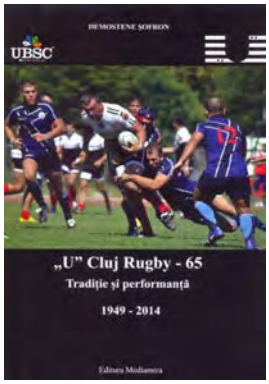
„U" Cluj Rugby - 65 Tradiţie şi performanţă 1949-2014

(Rugby „U" Cluj - 65 Tradition and performance 1949-2014)

Autor: Demostene Şofron

Editura: Mediamira, Cluj-Napoca, 2014

100 pagini



Preambulul, intitulat *2014 aniversar*, argumentează cărui fapt i se datorează apariţia cărţii, şi anume, împlinirea a 65 de ani de existenţă în peisajul sportului clujean şi naţional, a echipei de rugby „U" Cluj. Primul capitol intitulat „65" abordează pe scurt, atât literar cât şi statistic, an de an, începând din 1950, până în prezent, evoluţia echipei de rugby „U", cînd la 10 martie, presa vremii consemnează primul antrenament oficial al unei echipe clujene intitulată "Ştiinţa Cluj". Capitolul următor, *Cupa României*, cuprinde cele 6 prezenţe ale rugbyştilor clujeni în cea de a doua competiţie ca importanţă naţională fiind menţionate şi fazele până unde s-a ajuns. Cele mai importante finale jucate au fost cele din 1998 şi 1999, jucate dar pierdute cu Dinamo respectiv Remin Baia-Mare. Capitolul al 3-lea, *Juniorii*, descrie începuturile echipelor de juniori din Cluj, cu menţionarea antrenorilor respectivi. O distincţie specială în acest capitol pentru Octavian Chihaia, antrenor la CSS Locomotiva Cluj, prezent în calitate de antrenor al Naţionalei la patru ediţii ale Cupei Mondiale. Într-un capitol aparte autorul cinsteşte memoria unuia dintre cei mai complecşi jucători pe care i-a avut rugby-ul clujean - *Memorialul Floricică Murariu*. Întîlnirile internaţionale care reţin atenţia sunt tratate în capitolul *Rugby-ul clujean, în context internaţional*. Firesc, urmează capitolul *Internaţionalii clujeni*, pe parcursul căruia sunt amintiţi: Radu Demian, Mircea Rusu, Nicolae Cordoş, Silviu Căliman, Alexandru Paloşanu, Petre Motreanu şi mulţi alţii. Într-un capitol distinct intitulat *Internaţionalii clujeni la Cupa Mondială* sunt menţionaţi rugbyştii clujeni care de-a lungul timpului au făcut parte din echipa naţională la Cupa Mondială. Cu cât ne apropiem de finalul cărţii, titlurile capitolelor sunt tot mai interesante. Acestea sunt, în succesiunea lor, următoarele: *Preşedinţii secţiei de rugby „U" Cluj*, începând cu Constantin Schipor în 1949 şi încheind cu Traian Scridon în zilele noastre, *Echipa de rugby feminin a „U" Cluj*, care a luat fiinţă în anul 1912, iniţiator - Octavian Chihaia, *Arbitri clujeni de rugby* în care autorul se opreşte asupra actualilor Ioan Bărnuţi, Emil

Pârţoc şi Gheorghe Sabău şi capitolul *Familiile rugby-ului clujean*, în care sunt amintiţi fraţii, taţii şi fiii, tată-fiu-nepot, foşti sau actuali jucători de rugby. Urmează un scurt capitol de statistică intitulat *Campionatele Naţionale ale României, Divizia A, Divizia naţională, Superliga CEC Bank* în care se face o statistică completă a titlurilor naţionale All-Time obţinute de toate echipele româneşti începând din 1914 până în 2014. Penultimul capitol, *Amintiri*, este dedicat unor extrase din dialogurile, interviurile sau declaraţiile unor „grei" ai rugby-ului clujean. Cartea se încheie cu aşa numitele *Curiozităţi... rugbystice*, capitol care face o enumerare, însoţită de scurte comentarii, despre unele personalităţi române şi mondiale care au practicat rugby-ul în tinereţe: Jean Giraudoux, Christian Barnard, Richard Burton, Prinţul Şerban Ghica, Sergiu Nicolaescu, Ilarion Ciobanu, George Vraca li alţii.

Cartea se bazează pe consultarea unui important număr de referinţe bibliografice şi colecţiile unor importante cotidiene de sport din perioade diferite. Anexa cuprinde un număr de 36 de fotografii color şi 20 de fotografii alb-negru mai vechi şi mai noi, seniori şi juniori.

În concluzie, cartea merită achiziţionată şi citită.

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Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 4, October-December 2014, 367–368

EVENTS
EVENIMENTE

Workshop
Physical education classes and sports activities applied to specific rural environment conditions, in Cluj pre-university education
Lecţia de educaţie fizică şi activităţile sportive aplicate în condiţii specifice mediului rural, în învăţământul preuniversitar clujean

On the twelfth day of the month of December 2014, a splendid winter day, with snow and lots of sun, an open physical education class on skis was conducted. Mr. Anghel Todea, a titular teacher at the School in Beliș, a mountain locality situated at 1400 m altitude, presented a lesson whose content was entirely developed on skis. The specificity of cross-country skiing was given by the local alpine plateaus, across which a 600 m trail was easy to lay out.

Without insisting on content, we can only say that the lesson involved an amount of effort within the range of aerobic exercise, using methods specific to cross-country skiing. The subsequent lesson analysis as well as the workshop on the topic of the county school skiing calendar for 2015 required the intervention and the collaboration of the 47 methodologists who attended the event.

A retrospective view of the county competitions held so far was given. It was established that Cluj county, through the organization of cross-country and alpine skiing competitions, occupies a unique national position among all the other Romanian counties. Thus, Cluj county has seven skiing centers that organize seven consecutive skiing competitions every year, to which two centers that organize cross-country races in the off-season are added. The cross-country skiing centers participating in this competition circuit are the following: Rogojel, Râșca, Sâncrai, Mărișel, Beliș, Băișoara, Râșca, and also, there are two centers where off-season cross-country racing competitions are held - Răchițele and Dâbâca. The competition with the longest tradition is the *Small Mountain Rangers Cup*, organized for the first time in 1973, in Băișoara. While some editions of this competition were not held, its 36th edition will be organized on 22 February 2015. Then, follows the *Pelaghia Roșu Cup*, organized in Mărișel, which will reach its 27th edition on 7 February 2015, the *Scoruşet Cup* that will be held in Beliș for the 20th time on 14 February 2015, the *Sălănducu Cup*, organized in Râșca, which will reach its 17th edition on 24 January 2015. The *Snow Festival* competition, a national competition including alpine skiing that will reach its 14th edition, also takes place in Băișoara. The 11th edition of the *Tomordok Cup* will be organized in Sâncrai, on 31 January 2015. Other more recently founded competitions are the *Vlădeasa Cup*, whose 3rd edition will be held on 17 January 2015.

In the off-season, cross-country racing competitions or cross-country racing and cyclotourism competitions are organized: in Râșca and Răchițele, three editions of cross-country races have been so far organized in spring and autumn, respectively, in Dâbâca, there have been two editions of cross-country racing competitions in spring, and in Rogojel, the first edition of cyclotourism was organized in 2014.

All these competitions are supported by the Methodological Circle of the Cluj county physical education and sport teachers, coordinated by the methodologists.

* * *

Cea de a douăsprăzecea zi a lunii decembrie 2014, o zi splendidă de iarnă, cu zăpadă şi mult soare, a impus ca lecţia deschisă oferită să se desfăşoare pe schiuri. Profesorul Anghel Todea, titular la Școala din Beliș, o localitate de munte, situată la o altitudine de 1400 m, a prezentat o lecție al cărei conţinut s-a desfăşurat în întregime pe schiuri. Specificul schi-fond l-a dat relieful local constituit din platouri alpine, pe care s-a reuşit cu uşurinţă formarea unui traseu de 600 m.

Fără a insista asupra conţinutului, putem doar să spunem că lecţia a solicitat participanţii în limitele unui efort aerob, prin intermediul unor mijloace specifice schiului-fond. Analiza lecţiei precum şi workshopul care a urmat, pe tema calendarului şcolar judeţean la schi, care se va desfăşura pe durata anului 2015, au solicitat intervenţia şi colaborarea celor 37 de metodişti care au asistat la eveniment.

A fost efectuată o retrospectivă a ediţiilor judeţene desfăşurate până în acest moment. S-a stabilit faptul că judeţul Cluj, prin organizarea de competiţii de schi fond şi alpin, reprezintă un unicat naţional între toate celelalte judeţe ale României. Astfel, judeţul Cluj dispune de şapte centre de schi care organizează sistematic (anual) şapte concursuri de schi consecutive, la care se adaugă două centre care organizează crosuri, în extrasezon. Centrele de schi fond care participă la circuitul acestor concursuri sunt următoarele: Rogojel, Râşca, Sâncrai, Mărişel, Beliş, Băişoara, Râşca şi două centre unde în extrasezon se tin concursuri de cros - Răchiţele şi Dăbâca. Competiţia cu cea mai mare tradiţie este *Cupa Micii vânători de munte*, cu prima ediţie organizată în anul 1973 la Băişoara. Cu unele ediţii lipsă această competiţie a ajuns în faţa ediţiei a 36-a, care va fi organizată în 22 februarie 2015. Urmează *Cupa Pelaghia Roşu* organizată la Mărişel, care va ajunge la 27 ediţii pe data de 7 februarie 2015, *Cupa Scoruşet* organizată la Beliş, care va avea 20 ediţii pe data de 14 februarie 2015, *Cupa Sălănducu*, organizată la Râşca şi care va organiza a 17-a ediţie în 24 ianuarie 2015. La Băişoara se organizează şi competiţia *Serbările zăpezii* - Concurs Naţional care cuprinde şi schi alpin şi care a ajuns în faţa ediţiei a 14-a. *Cupa Tomordok* de la Sâncrai, a ajuns la ediţia a 10-a şi va organiza ediţia a 11-a pe 31 ianuarie 2015. Alte competiţii înfiinţate mai recent, cu ediţii mai puţine la activ, sunt *Cupa Vlădeasa*, cu 2 ediţii organizate, va fi a 3-a pe 17 ianuarie 2015.

În extrasezon, se organizează competiţii de cros sau cros şi cicloturism: La Râşca şi Răchiţele au fost organizate până acum trei ediţii de cros primăvara, respectiv toamna, la Dăbâca au fost organizate pînă în prezent două ediţii de cros-primăvara, iar la Rogojel a fost organizată anul acesta (2014), prima ediţie de cicloturism.

Toate aceste competiţii sunt susţinute de către Cercul metodic al profesorilor de educaţie fizică şi sport al judeţului Cluj, coordonaţi de metodişti.

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Organization of the group at the beginning of the class.

Specific cross-country skiing exercises.

Before starting a new exercise.

Exercise under the supervision of Professor Anghel Todea.

The cross-country skiing relay race.

End of the class.

A group of teacher-methodologists, together with the specialty inspector, Prof. Cristian Potora – first to the right.

Group picture of the methodologists.

Analysis of the lesson, followed by discussions related to the 2015 competition calendar .

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 4, October-December 2014, 369–371

FOR THE ATTENTION OF CONTRIBUTORS

The subject of the Journal

The journal has a multidisciplinary nature oriented toward biomedical, health, exercise, social sciences fields, applicable in activities of physical training and sport, so that the dealt subjects and the authors belong to several disciplines in these fields. The main rubrics are: "Original studies" and "Reviews".

Regarding "Reviews" the main subjects that are presented are: oxidative stress in physical effort; mental training; psychoneuroendocrinology of sport effort; physical culture in the practice of the family doctor; extreme sports and risks; emotional determinatives of performance; the recovery of patients with spinal column disorders; stress syndromes and psychosomatics; olympic education, legal aspects of sport; physical effort in the elderly; psychomotricity disorders; high altitude sportive training; fitness; biomechanics of movements; EUROFIT tests and other evaluation methods of physical effort; adverse reactions of physical effort; sport endocrinology; depression in sportsmen/women; classical and genetic drug usage; Olympic Games etc.

Among articles devoted to original studies and researches we are particularly interested in the following: the methodology in physical education and sport; influence of some ions on effort capacity; psychological profiles of students regarding physical education; methodology in sport gymnastics; the selection of performance sportsmen.

Other articles approach particular subjects regarding different sports: swimming, rhythmic and artistic gymnastics, handball, volleyball, basketball, athletics, ski, football, field and table tennis, wrestling, sumo.

The authors of the two rubrics are doctors, professors and educators, from universities and preuniversity education, trainers, scientific researchers etc.

Other rubrics of the journal are: the editorial, editorial news, reviews of the latest books in the field and others that are presented rarely (inventions and innovations, universitaria, preuniversitaria, forum, memories, competition calendar, portraits, scientific events).

We highlight the rubric "The memory of the photographic eye", where photos, some very rare, of sportsmen in the past and present are presented.

Articles signed by authors from the Republic of Moldova regarding the organization of sport education, variability of the cardiac rhythm, the stages of effort adaptability and articles by some authors from France, Portugal, Canada must also be mentioned.

The main objective of the journal is highlighting the results of research activities as well as the permanent and actual dissemination of information for specialists in the field. The journal assumes an important role regarding the achievement of necessary scores of the teaching staff in the university and preuniversity education as well as of doctors in the medical network (by recognizing the journal by the Romanian College of Physicians), regarding didactic and professional promotion.

Another merit of the journal is the obligatory publication of the table of contents and an English summary for all articles. Frequently articles are published in extenso in a language with international circulation (English, French).

The journal is published quarterly and the works are accepted for publication in the Romanian and English language. The journal is sent by e-mail or on a floppy disk (or CD-ROM) and printed, by mail at the address of the editorial staff. The works of contributors that are resident abroad and of Romanian authors must be mailed to the Editorial staff at the following address:

„Palestrica of the third millennium – Civilization and sport"
Chief Editor: Prof. dr. Traian Bocu
Contact address: palestrica@gmail.com or traian_bocu@yahoo.com
Mail address: Clinicilor street no. 1 postal code 400006, Cluj-Napoca, România
Telephone:0264-598575
Website: www.pm3.ro

Objectives

Our intention is that the journal continues to be a route to highlight the research results of its contributors, especially by stimulating their participation in project competitions. Articles that are published in this journal are considered as part of the process of promotion in one's university career (accreditation that is obtained after consultation with the National Council for Attestation of Universitary Titles and Diplomas).

We also intend to encourage the publication of studies and research, that include original relevant elements especially from young people. All articles must bring a minimum of personal contribution (theoretical or practical), that will be highlighted in the article.

In the future we propose to accomplish criteria that would allow the promotion of the journal to superior levels according international recognition.

THE STRUCTURE AND SUBMISSION OF ARTICLES

The manuscript must be prepared according to the stipulations of the International Committee of Medical Journal Editors (http://www.icmjee.org).

The number of words for the electronic format:

– 4000 words for original articles;

– 2000 words for case studies;
– 5000-6000 words for review articles.

Format of the page: edited in WORD format, A4. Printed pages of the article will be numbered successively from 1 to the final page.

Font: Times New Roman, size 11 pt.; it should be edited on a full page, with diacritical marks, double spaced, respecting equal margins of 2 cm.

Illustrations:

The images (graphics, photos etc.) should be numbered consecutively in the text, with arabic numbers. They should be edited with EXCEL or SPSS programs, and sent as distinct files: „figure 1.tif", „figure 2. jpg", and at the editors demanding in original also. Every graphic should have a legend, written **under** the image.

The tables should be numbered consecutively in the text, with roman numbers, and sent as distinct files, accompanied by a legend that will be put **above** the table.

PREPARATION OF THE ARTICLES

1. Title page: – includes the title of article (maximum 45 characters), the name of authors followed by surname, work place, mail address of the institute and mail adress and e-mail address of the first author. It will follow the name of article in the English language.

2. Summary: For original articles a summary structured like this is necessary: (Premize-Background, Obiective-Aims, Metode-Methods, Resultate-Results, Concluzii-Conclusions), in the Romanian language, of maximum 250 words, followed by 3-8 key words (if its possible from the list of established terms). All articles will have a summary in the English language. Within the summary (abstract) abbreviations, footnotes or bibliographic references should not be used.

Premises and objectives. Description of the importance of the study and explanation of premises and research objectives.

Methods. Include the following aspects of the study:

Description of the basic category of the study: of orientation and applicative.

Localization and the period of study. Description and size of groups, sex (gender), age and other socio-demographic variables should be given.

Methods and instruments of investigation that are used.

Results. The descriptive and inferential statistical data (with specification of the used statistical tests): the differences between the initial and the final measurement, for the investigated parameters, the significance of correlation coefficients are necessary. The specification of the level of significance (the value ***p*** or the dimension of effect ***d***) and the type of the used statistical test etc are obligatory.

Conclusions. Conclusions that have a direct link with the presented study should be given.

Orientation articles and case studies should have an unstructured summary (without respecting the structure of experimental articles) to a limit of 150 words.

3. Text

Original articles should include the following chapters which will not be identical with the summary titles: Introduction (General considerations), Hypothesis, Materials and methods (including ethical and statistical informations), Results, Discussing results, Conclusions and suggestions. Other type of articles, as orientation articles, case studies, Editorials, do not have an obligatory format. Excessive abbreviations are not recommended. The first abbreviation in the text is represented first *in extenso*, having its abbreviation in parenthesis, and thereafter the short form should be used.

Authors must undertake the responsibility for the correctness of published materials.

4. Bibliography

The bibliography should include the following data:

For articles from journals or other periodical publications the international Vancouver Reference Style should be used: the name of all authors as initials and the surname, the year of publication, the title of the article in its original language, the title of the journal in its international abbreviation (italic characters), number of volume, pages.

Articles: Pop M, Albu VR, Vişan D et al. Probleme de pedagogie în sport. Educaţie Fizică şi Sport 2000; 25(4):2-8.

Books: Drăgan I (coord.). Medicina sportivă, Editura Medicală, 2002, Bucureşti, 2002, 272-275.

Chapters from books: Hăulică I, Bălţatu O. Fiziologia senescenţei. In: Hăulică I. (sub red.) Fiziologia umană, Ed. Medicală, Bucureşti, 1996, 931-947.

Starting with issue 4/2010, every article should include a minimum of 15 bibliographic references and a maximum of 100, mostly journals articles published in the last 10 years. Only a limited number of references (1-3) older than 10 years will be allowed. At least 20% of the cited resources should be from recent international literature (not older than 10 years).

Peer-review process

In the final stage all materials will be closely reviewed by at least two competent referees in the field (Professors, and Docent doctors) so as to correspond in content and form with the requirements of an international journal. After this stage, the materials will be sent to the journal's referees, according to their profiles. After receiving the observations from the referees, the editorial staff shall inform the authors of necessary corrections and the publishing requirements of the journal. This process (from receiving the article to transmitting the observations) should last about 4 weeks. The author will be informed if the article was accepted for publication or not. If it is accepted, the period of correction by the author will follow in order to correspond to the publishing requirements.

Conflict of interest

The authors must mention all possible conflicts of interest including financial and other types. If you are sure that there is no conflict of interest we ask you to mention this. The financing sources should be mentioned in your work too.

Specifications

The specifications must be made only linked to the people outside the study but which have had a substantial contribution, such as some statistical processing or review of the text in the English language. The authors have the responsibility to obtain the written permission from the mentioned persons with the name written within the respective chapter, in case the readers refer to the interpretation of results and conclusions of these persons. Also it should be specified if the article uses some partial results from certain projects or if these are based on master or doctoral theses sustained by the author.

Ethical criteria

The Editors will notify authors in due time, whether their article is accepted or not or whether there is a need to modify texts. Also the Editors reserve the right to edit articles accordingly. Papers that have been printed or sent for publication to other journals will not be accepted. All authors should send a separate letter containing a written statement proposing the article for submission, pledging to observe the ethics of citation of sources used (bibliographic references, figures, tables, questionnaires).

For original papers, according to the requirements of the Helsinki Declaration, the Amsterdam Protocol, Directive 86/609/EEC, and the regulations of the Bioethical Committees from the locations where the studies were performed, the authors must provide the following:

- the informed consent of the family, for studies in children and juniors;
- the informed consent of adult subjects, patients and athletes, for their participation;
- malpractice insurance certificate for doctors, for studies in human subjects;
- certificate from the Bioethical Committees, for human study protocols;
- certificate from the Bioethical Committees, for animal study protocols.

The data will be mentioned in the paper, in the section Materials and Methods. The documents will be obtained before the beginning of the study. Will be mentioned also the registration number of the certificate from the Bioethical Committees.

Editorial submissions will be not returned to authors, whether published or not.

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Please note that in 2010 a tax for each article submitted was introduced. Consequently, all authors of articles will pay the sum of 150 RON to the Romanian Medical Society of Physical Education and Sport published above. Authors who have paid the subscription fee will be exempt from this tax. Other information can be obtained online at www.pm3.ro "Instructions for Authors", at our e-mail address palestrica@gmail.com or at the postal address: 1, Clinicilor St., 400006, Cluj-Napoca, Romania, phone: +40264-598575.

INDEXING

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Palestrica Mileniului III – Civilizaţie şi Sport
Vol. 15, no. 4, Octombrie-Decembrie 2014, 372–374

ÎN ATENŢIA COLABORATORILOR

Tematica revistei

Ca tematică, revista are un caracter multidisciplinar orientat pe domeniile biomedical, sănătate, efort fizic, ştiinţe sociale, aplicate la activităţile de educaţie fizică şi sport, astfel încât subiectele tratate şi autorii aparţin mai multor specialităţi din aceste domenii. Principalele rubrici sunt: „Articole originale" şi „Articole de sinteză".

Exemplificăm rubrica „Articole de sinteză" prin temele importante expuse: stresul oxidativ în efortul fizic; antrenamentul mintal; psihoneuroendocrinologia efortului sportiv; cultura fizică în practica medicului de familie; sporturi extreme şi riscuri; determinanţi emoţionali ai performanţei; recuperarea pacienţilor cu suferinţe ale coloanei vertebrale; sindroame de stres şi psihosomatică; educaţia olimpică, aspecte juridice ale sportului; efortul fizic la vârstnici; tulburări ale psihomotricităţii; pregătirea sportivă la altitudine; fitness; biomecanica mişcărilor; testele EUROFIT şi alte metode de evaluare a efortului fizic; reacţii adverse ale eforturilor; endocrinologie sportivă; depresia la sportivi; dopajul clasic şi genetic; Jocurile Olimpice etc.

Dintre articolele consacrate studiilor şi cercetărilor experimentale notăm pe cele care vizează: metodica educaţiei fizice şi sportului; influenţa unor ioni asupra capacităţii de efort; profilul psihologic al studentului la educaţie fizică; metodica în gimnastica sportivă; selecţia sportivilor de performanţă.

Alte articole tratează teme particulare vizând diferite sporturi: înotul, gimnastica ritmică şi artistică, handbalul, voleiul, baschetul, atletismul, schiul, fotbalul, tenisul de masă şi câmp, luptele libere, sumo.

Autorii celor două rubrici de mai sus sunt medici, profesori şi educatori din învăţământul universitar şi preuniversitar, antrenori, cercetători ştiinţifici etc.

Alte rubrici ale revistei sunt: editorialul, actualităţile editoriale, recenziile unor cărţi - ultimele publicate în domeniu, la care se adaugă şi altele prezentate mai rar (invenţii şi inovaţii, universitaria, preuniversitaria, forum, remember, calendar competiţional, portrete, evenimente ştiinţifice).

Subliniem rubrica "Memoria ochiului fotografic", unde se prezintă fotografii, unele foarte rare, ale sportivilor din trecut şi prezent.

De menţionat articolele semnate de autori din Republica Moldova privind organizarea învăţământului sportiv, variabilitatea ritmului cardiac, etapele adaptării la efort, articole ale unor autori din Franţa, Portugalia, Canada.

Scopul principal al revistei îl constituie valorificarea rezultatelor activităţilor de cercetare precum şi informarea permanentă şi actuală a specialiştilor din domeniile amintite. Revista îşi asumă şi un rol important în îndeplinirea punctajelor necesare cadrelor didactice din învăţământul universitar şi preuniversitar precum şi medicilor din reţeaua medicală (prin recunoaşterea revistei de către Colegiul Medicilor din România), în avansarea didactică şi profesională.

Un alt merit al revistei este publicarea obligatorie a cuprinsului şi a câte unui rezumat în limba engleză, pentru toate articolele. Frecvent sunt publicate articole în extenso într-o limbă de circulaţie internaţională (engleză, franceză).

Revista este publicată trimestrial iar lucrările sunt acceptate pentru publicare în limba română şi engleză. Articolele vor fi redactate în format WORD (nu se acceptă articole în format PDF). Expedierea se face prin e-mail sau pe dischetă (sau CD-ROM) şi listate, prin poştă pe adresa redacţiei. Lucrările colaboratorilor rezidenţi în străinătate şi ale autorilor români trebuie expediate pe adresa redacţiei:

Revista «Palestrica Mileniului III»
Redactor şef: Prof. dr. Traian Bocu
Adresa de contact: palestrica@gmail.com sau traian_bocu@yahoo.com
Adresa poştală: Str. Clinicilor nr.1 cod 400006, Cluj-Napoca, România
Telefon:0264-598575
Website: www.pm3.ro

Obiective

Ne propunem ca revista să continue a fi o formă de valorificare a rezultatelor activităţii de cercetare a colaboratorilor săi, în special prin stimularea participării acestora la competiţii de proiecte. Menţionăm că articolele publicate în cadrul revistei sunt luate în considerare în procesul de promovare în cariera universitară (acreditare obţinută în urma consultării Consiliului Naţional de Atestare a Titlurilor şi Diplomelor Universitare).

Ne propunem de asemenea să încurajăm publicarea de studii şi cercetări, care să cuprindă elemente originale relevante mai ales de către tineri. Toate articolele vor trebui să aducă un minimum de contribuţie personală (teoretică sau practică), care să fie evidenţiată în cadrul articolului.

În perspectivă ne propunem îndeplinirea criteriilor care să permită promovarea revistei la niveluri superioare cu recunoaştere internaţională.

STRUCTURA ŞI TRIMITEREA ARTICOLELOR

Manuscrisul trebuie pregătit în acord cu prevederile Comitetului Internaţional al Editurilor Revistelor Medicale (http://www.icmjee.org).

Numărul cuvintelor pentru formatul electronic:

– 4000 cuvinte pentru articolele originale,
– 2000 de cuvinte pentru studiile de caz,
– 5000–6000 cuvinte pentru articolele de sinteză.

Format pagină: redactarea va fi realizată în format A4. Paginile listate ale articolului vor fi numerotate succesiv de la 1 până la pagina finală.

Font: Times New Roman, mărime 11 pt.; redactarea se va face pe pagina întreagă, cu diacritice, la două rânduri, respectând margini egale de 2 cm pe toate laturile.

Ilustraţiile:

Figurile (grafice, fotografii etc.) vor fi numerotate consecutiv în text, cu cifre arabe. Vor fi editate cu programul EXCEL sau SPSS, şi vor fi trimise ca fişiere separate: „figura 1.tif", „figura 2. jpg", iar la solicitarea redacţiei şi în original. Fiecare grafic va avea o legendă care se trece **sub** figura respectivă.

Tabelele vor fi numerotate consecutiv în text, cu cifre romane, şi vor fi trimise ca fişiere separate, însoţite de o legendă ce se plasează **deasupra** tabelului.

PREGĂTIREA ARTICOLELOR

1. Pagina de titlu: – cuprinde titlul articolului (maxim 45 caractere), numele autorilor urmat de prenume, locul de muncă, adresa postală a instituţiei, adresa poştală şi adresa e-mail a primului autor. Va fi urmat de titlul articolului în limba engleză.

2. Rezumatul: Pentru articolele experimentale este necesar un rezumat structurat (Premize-Background, Obiective-Aims, Metode-Methods, Rezultate-Results, Concluzii-Conclusions), în limba română, de maxim 250 cuvinte (20 de rânduri, font Times New Roman, font size 11), urmat de 3–5 cuvinte cheie (dacă este posibil din lista de termeni consacraţi). Toate articolele vor avea un rezumat în limba engleză. Nu se vor folosi prescurtări, note de subsol sau referinţe.

Premize şi obiective: descrierea importanţei studiului şi precizarea premizelor şi obiectivelor cercetării.

Metodele: includ următoarele aspecte ale studiului:

Descrierea categoriei de bază a studiului: de orientare sau aplicativ.

Localizarea şi perioada de desfăşurare a studiului. Colaboratorii vor prezenta descrierea şi mărimea loturilor, sexul (genul), vârsta şi alte variabile socio-demografice.

Metodele şi instrumentele de investigaţie folosite.

Rezultatele vor prezenta datele statistice descriptive şi inferenţiale obţinute (cu precizarea testelor statistice folosite): diferenţele dintre măsurătoarea iniţială şi cea finală, pentru parametri investigaţi, semnificaţia coeficienţilor de corelaţie. Este obligatorie precizarea nivelului de semnificaţie (valoarea ***p*** sau mărimea efectului ***d***) şi a testului statistic folosit etc.

Concluziile care au directă legătură cu studiul prezentat.

Articolele de orientare şi studiile de caz vor avea un rezumat nestructurat (fără a respecta structura articolelor experimentale) în limita a 150 cuvinte (maxim 12 rânduri, font Times New Roman, font size 11).

3. Textul

Articolele experimentale vor cuprinde următoarele capitole: Introducere, Ipoteză, Materiale şi Metode (inclusiv informaţiile etice şi statistice), Rezultate, Discutarea rezultatelor, Concluzii (şi propuneri). Celelalte tipuri de articole, cum ar fi articolele de orientare, studiile de caz, editorialele, nu au un format impus.

Răspunderea pentru corectitudinea materialelor publicate revine în întregime autorilor.

4. Bibliografia

Bibliografia va cuprinde:

Pentru articole din reviste sau alte periodice se va menţiona: numele tuturor autorilor şi iniţialele prenumelui, anul apariţiei, titlul articolului în limba originală, titlul revistei în prescurtare internaţională (caractere italice), numărul volumului, paginile

Articole: Pop M, Albu VR, Vişan D et al. Probleme de pedagogie în sport. Educaţia Fizică şi Sportul 2000; 25(4):2-8.

Cărţi: Drăgan I (coord.). Medicina sportivă aplicată. Ed. Editis, Bucureşti 1994, 372-375.

Capitole din cărţi: Hăulică I, Bălţatu O. Fiziologia senescenţei. În: Hăulică I. (sub red.) Fiziologia umană. Ed. Medicală, Bucureşti 1996, 931-947.

Începând cu revista 4/2010, fiecare articol va trebui să se bazeze pe un minimum de 15 şi un maximum de 100 referinţe bibliografice, în majoritate articole nu mai vechi de 10 ani. Sunt admise un număr limitat de cărţi şi articole de referinţă (1-3), cu o vechime mai mare de 10 ani. Un procent de 20% din referinţele bibliografice citate trebuie să menţioneze literatură străină studiată, cu respectarea criteriului actualităţii acesteia (nu mai vechi de 10 ani).

Procesul de recenzare (peer-review)

Într-o primă etapă toate materialele sunt revizuite riguros de cel puţin doi referenţi competenţi în domeniu respectiv (profesori universitari doctori şi doctori docenţi) pentru ca textele să corespundă ca fond şi formă de prezentare cerinţelor unei reviste serioase. După această etapă materialele sunt expediate referenţilor revistei, în funcţie de profilul materialelor. În urma observaţiilor primite din partea referenţilor, redacţia comunică observaţiile autorilor în vederea corectării acestora şi încadrării în cerinţele de publicare impuse de revistă. Acest proces (de la primirea articolului până la transmiterea observaţiilor) durează aproximativ 4 săptămâni. Cu această ocazie se comunică autorului daca articolul a fost acceptat spre publicare sau nu. În situaţia acceptării, urmează perioada de corectare a articolului de către autor în vederea încadrării în criteriile de publicare.

Conflicte de interese

Se cere autorilor să menţioneze toate posibilele conflicte de interese incluzând relaţiile financiare şi de alte tipuri. Dacă sunteţi siguri că nu există nici un conflict de interese vă rugăm să menţionaţi acest lucru. Sursele de finanţare ar trebui să

fie menţionate în lucrarea dumneavoastră.

Precizări

Precizările trebuie făcute doar în legătură cu persoanele din afara studiului, care au avut o contribuţie substanţială la studiul respectiv, cum ar fi anumite prelucrări statistice sau revizuirea textului în limba engleză. Autorii au responsabilitatea de a obţine permisiunea scrisă din partea persoanelor menţionate cu numele în cadrul acestui capitol, în caz că cititorii se referă la interpretarea rezultatelor şi concluziilor acestor persoane. De asemenea, la acest capitol se vor face precizări în cazul în care articolul valorifică rezultate parţiale din anumite proiecte sau dacă acesta se bazează pe teze de masterat sau doctorat susţinute de autor, alte precizări.

Criterii deontologice

Redacţia va răspunde în timp util autorilor privind acceptarea, neacceptarea sau necesitatea modificării textului şi îşi rezervă dreptul de a opera modificări care vizează forma lucrărilor.

Nu se acceptă lucrări care au mai fost tipărite sau trimise spre publicare la alte reviste. Autorii vor trimite redacţiei odată cu articolul propus spre publicare, într-un fişier word separat, o declaraţie scrisă în acest sens, cu angajamentul respectării normelor deontologice referitoare la citarea surselor pentru materialele folosite (referinţe bibliografice, figuri, tabele, chestionare).

Pentru articolele originale, în conformitate cu îndeplinirea condiţiilor Declaraţiei de la Helsinki, a Protocolului de la Amsterdam, a Directivei 86/609/EEC şi a reglementărilor Comisiilor de Bioetică din locaţiile unde s-au efectuat studiile, autorii trebuie să prezinte:

- acordul informat din partea familiei, pentru studiile pe copii şi juniori;
- acordul informat din partea subiecţilor adulţi, pacienţi şi sportivi, pentru participare;
- adeverinţă de Malpraxis pentru medici, pentru cercetările/studiile pe subiecţi umani;
- adeverinţă din partea Comisiilor de Etică, pentru protocolul de studiu pe subiecţi umani;
- adeverinţă din partea Comisiilor de Bioetică, pentru protocolul de studiu pe animale.

Datele vor fi menţionate în articol la secţiunea Material şi metodă. Documentele vot fi obţinute înainte de începerea studiului. Se va menţiona şi numărul de înregistrare al adeverinţei din partea Comisiilor de Etică.

Materialele trimise la redacţie nu se restituie autorilor, indiferent dacă sunt publicate sau nu.

ÎN ATENŢIA SPONSORILOR

Solicitările pentru spaţiile de reclamă, vor fi adresate redacţiei revistei "Palestrica Mileniului III", Str. Clinicilor nr. 1, cod 400006 Cluj-Napoca, România. Preţul unei pagini de reclamă full color A4 pentru anul 2012 va fi de 250 EURO pentru o apariţie şi 800 EURO pentru 4 apariţii. Costurile publicării unui Logo pe coperţile revistei, vor fi stabilite în funcţie de spaţiul ocupat. Plata se va face în contul Societăţii Medicale Române de Educaţie Fizică şi Sport, CIF 26198743. Banca Transilvania, sucursala Cluj Cod IBAN: RO32 BTRL 0130 1205 S623 12XX (LEI).

ÎN ATENŢIA ABONAŢILOR

Revista "Palestrica Mileniului III" este tipărită trimestrial, preţul unui abonament fiind pentru străinătate de 100 Euro pentru instituţii, şi 50 Euro individual. Pentru intern, preţul unui abonament instituţional este de 120 lei, al unui abonament individual de 100 lei. Menţionăm că taxele de difuzare poştală sunt incluse în costuri.

Plata abonamentelor se va face prin mandat poştal în contul Societăţii Medicale Române de Educaţie Fizică şi Sport, CIF 26198743. Banca Transilvania, sucursala Cluj Cod IBAN: RO32 BTRL 0130 1205 S623 12XX (LEI); RO07 BTRL 01304205 S623 12XX (EURO); RO56 BTRL 01302205 S623 12XX (USD). SWIFT: BTRLRO 22

Precizăm că începând cu anul 2010 a fost introdusă taxa de articol. Ca urmare, toţi autorii semnatari ai unui articol vor achita împreună suma de 150 Lei, în contul Societăţii Medicale Române de Educaţie Fizică şi Sport publicat mai sus.

Autorii care au abonament vor fi scutiţi de această taxă de articol.

Alte informaţii se pot obţine online de pe www.pm3.ro „Pentru autori" sau pe adresa de mail a redacţiei palestrica@gmail.com sau pe adresa poştală: Str. Clinicilor nr.1 cod 400006, Cluj-Napoca, România, Telefon:0264-598575.

INDEXAREA

Titlul revistei: Palestrica Mileniului III – Civilizaţie şi sport

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Cuprinsul, rezumatele şi instrucţiunile pentru autori se găsesc pe pagina de Internet: http://www.pm3.ro Accesul la cuprins şi articole in extenso (în format .pdf) este gratuit.

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