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CIVILIZATION AND SPORT

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Confronted with such a critical reality as that described in the previous issue of our journal's editorial (Dumitru, 2016), let us see what WHO Europe, the European Union and implicitly Romania have already done, and what they intend to do hereinafter. In this attempt, we will not look too far back in the past, and will just start with an extremely highly credited project, representing the will and commitment of all the 53 WHO European Region countries' health ministers; we refer to the *European Charter on counteracting obesity* (2), which has been adopted 10 years ago now. Among others, in the 3rd chapter (Monitoring progress), the *Charter* stipulates that "a three year progress report should be prepared, with the first due in 2010".

The report was presented on December 8, 2010 (12) by Zsuzanna Jakab (WHO Europe director), and is an example of bureaucratic document which practically contains nothing of what it should contain. Thus, out of its 18 slides, only one - the 7th - refers to the identifiable trends of overweight incidence among the adult population, the graphs and figures suggesting that, with some exceptions, in the majority of the countries, this increased even after the adoption of the *Charter*. As for the rest of the report, one can find an array of more or less new observational data, and nothing about why after over 3 years no beneficial effects of the *Charter* could be perceived, nothing about the expected and necessary corrections and improvements, and also nothing about the next planned report. These imperfections of the report are in fact understandable, if we take into consideration that just from the beginning of her exposition, Mrs. Jakab has admitted that in comparison with 2006 - the moment of the *Charter's* adoption - "we have made some good progress but much is still expected, and the truth is that obesity continues to rise in many countries" (12).

As it is well known, the *Charter* was initiated and coordinated by WHO Europe, whose specialised structure for physical activity - the topic of greatest interest for the present paper - is HEPA Europe (6). The objectives and principles of HEPA Europe are perfectly rational and generous indeed, and if you visit its official website you will find a plethora of data, information and documents speaking about the actions, activities, projects and instruments of work the different work groups (9 in total) have initiated and performed so far, since 2005 when the network was founded. Yet, no clear reference can be found to the most important aspect and the HEPA rationale; the impact the network activity and products have had on the percent of those regularly exercising or playing sport in Europe.

However, apart from the WHO Europe activities and programmes, the European Council and Commission themselves had and still have extremely numerous initiatives, plans, projects, actions, and instruments, continuously multiplied/amplified and financed with consistent generosity. A very good and useful image of the most important 20 projects financed between 2008 and 2013 within EU, in the problem of nutrition and physical activity as factors of obesity drop-off, is offered by a 78 page synthesis (13), published in 2014. It is a discreetly honest description that allows realizing what immense amounts of money and specialised human forces were raised, on the one hand, and that in fact the results of all these efforts and investments are those described by the unsatisfactory current statistics concerning obesity and physical inactivity incidence (Dumitru, 2016), on the other hand. It is a document that makes you feel highly indignant, and think: "If in the case of such a narrow field as is that of nutrition and physical activity the situation is like this, then what dimensions could bureaucracy, formalism and inefficient expenditure have at the entire level of the European Community?"

The reading of pages 6 to 13 in the above mentioned synthesis (13) is also very instructive for understanding the logic of the whole self-proliferating scaffolding [$] - perhaps more and more difficult to quit - of strategies (11), high level groups (7), action plans (1), health programs (3) and ways of collaboration with WHO Europe. A scaffolding which the EU Government (i.e. European Commission) has continuously amplified – neoplastically, it can be said - starting from March 2005 when the *EU Platform for Diet, Physical Activity and Health* (4) was launched. And what can be understood from those pages is that the Commission's answer to the great challenge of overweight

and obesity was the adoption of the *Strategy for Europe on Nutrition, Overweight and Obesity related health issues* (11), whose principal work instruments are the *EU Platform for Diet, Physical Activity and Health* (4) and the *High level group on nutrition and physical activity* (7). Also, that very recently (2014), the *High level group* has launched the 68 page *Action Plan on Childhood Obesity 2014-2020* (1), whose "overarching goal is to contribute to halting the rise in overweight and obesity in children and young people (0 – 18 years) by 2020". A laudable goal indeed, but completely unrealistic in our opinion, as long as *the Plan* seems to be based on the same diluted and evasive strategies that have already proved their ineffectiveness.

The last EU initiative we will refer to is a new "excrescence" - this time of the *Action Plan* (10). Its name is *Joint Action on Nutrition and Physical Activity* (10). The project was launched on September 1, 2015 and will be conducted over a period of 27 months. However, as usual, it brings nothing new, original, because as many others before it only intends to collect data. And again as usual, even if its title explicitly contains the concept of physical activity, the project is designed in such a manner that it will practically neglect this factor.

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Our expression is outspokenly and programmatically critical and full of suspicion towards the recent initiatives and measures of EU and WHO Europe, but this is justified by the outcomes to which ideas and programmes of the same style have led so far. And some (unfortunately not all) of the causes explaining the incriminated ineffectiveness were identified by an external independent evaluation (5) of the *Strategy for Europe on Nutrition* implementation. A type of audit pretty diluted as well, a mirror a little bit more realistic in which if the bureaucrats of the EU and WHO Europe sincerely look at themselves, maybe this could represent a promising hope.

The most important conclusions of the *Evaluation* (5) are that there are some positive results, yet not very notable, and that it is necessary to pay greater attention to physical activity promotion. A factor that has undoubtedly been neglected to date mainly because of the dominance of physicians within different organizations and forums. Overall, 5 years after the *Strategy* adoption, the outcomes are unconvincing and do not inspire hope when considering the extension of the obesity phenomenon and its high inertia. The explanations consist of the fact that most of the action taken in Europe to date has been of a relatively soft nature, without consistency, and primarily based on information provision and education, on limited interventions in specific environments (such as school) and on voluntary activities. And this even if there are opinions in favour of more vigorous measures and more firm rules (including of fiscal nature), which seem to prove more effective to combat overweight and obesity.

Frankly expressing its suspicion concerning the capacity of the European Commission to implement this type of measures, the Evaluation sounds a necessary note of warning when saying that it is obviously imperative to take more concrete and vigorous decisions and to more rigorously verify their implementation, taking into consideration that "without a new impetus there is a real risk that the interest in continuing to deal with the issue may fade, at least at the EU level". In fact - the document draws attention – "some disquieting signs that the enthusiasm and innovation is beginning to wear off can already be identified in the activity of both the *High Level Group* and *Platform*" (5).

If this is the situation at the EU level, then it is difficult to hope it will be better in Romania, where the reality is that very correctly suggested by the inspired title of a recent paper (9), which states that "the Romanian politics in the problem of non-transmissible diseases prevention are structures without substance". In the opinion of Prof. R. Chereches (director of the Public Health School in Cluj), this situation is explained by the non-ratification of all policies and recommendations coming from European and international forums, coupled with the non-implementation of those already ratified (9).

Regarding the specific aspects (i.e. minuses, since pluses are out of question) of fighting obesity in Romania, they need a more sound and systematic analysis. This is why we will only mention here that all that is to be undertaken in this respect until 2020 would have to have its rationale and origins in the *National Integrated Multiannual Plan for Health and Education for Health Promotion* (8). The problem is that this *Plan*, which is designed for the 2016-2020 period, was only launched on February 24, 2016; this means after about 2 months from the moment when it had to go into action. Moreover, it is worthy of mention that the *Plan* will be implemented through a special Commission at the level of each county, coordinated by a corresponding National Commission; but none of these commissions has been formed yet.

Are there still chances that physical inactivity and obesity will significantly decrease? And if so, what is to be done?

After so much time lost and after so many trials that have ended in a fiasco, it would be high time to become aware that a hard-hitting solution to the first question and a much more imaginative-creative and realistic answer to the second one are required. Something that is possible just after a very exigent analysis of the situation, much more exigent than that of the *Evaluation* (5) published in 2013. An analysis without any preconception, caution or distortion of the reality, which will address both the principles on which the strategies adopted to date are based, and the concrete methods and means proposed and put into practice until now. All performed not only from the perspective (ignored so far) of the benefit-cost ratio, but also from that of facing the harsh reality; the reality that we are facing with the last chance to avoid a biological catastrophe of the only rational being, as the human being pretends to be: the chance of inverting an evolution that unless interrupted, will result in the physical degeneration of the human race.

Of course, it is obvious that our position and information do not confer us the possibility of launching many viable, effective suggestions or solutions. However, we will take courage to advance the idea that for hoping to obtain other

type of outcomes than those harvested to date in the war "on life and death" with physical inactivity and obesity, it would be compulsory to adopt at least three important modifications in approaching the problems.

The first one refers to principles, is suggested by the above mentioned *Evaluation* (5), and would imply that - strictly and exclusively in the problems connected with the health of an individual - the human rights will be completed and counterbalanced by obligations and responsibilities. In other words, it is necessary to create a new legislative and social framework, designed to stimulate and determine each individual to be responsible for his/her own health, while being completely aware about the consequences of the lifestyle he/she adopts.

The second modification is organisational in its essence, and would imply a prompt and complete separation of preoccupations, measures, competences and responsibilities involving health nutrition from those specifically targeting the adoption of a healthy lifestyle and the rejection of physical inactivity. A case in which for physical activity promotion and implementation, only physicians with both appetence and expertise in the field, assisted by exercise and sport professionals, would be involved.

Finally, the third proposal complements and supports the previous one, and refers to the instruments of work used in collecting data about the incidence of sedentariness or, in other words, for evaluating and monitoring [#] the actual level of physical activity in the population. More concretely, we consider it is better to replace the administration of questionnaires with Eurofit battery tests (or with others, even if a significant amount of money was spent on them), which practically were ignored within the programs and campaigns of physical activity evaluation and promotion in the EU. This alteration of the approach would be beneficial taking into consideration that what effectively matters is not the amount of time an individual declares to exercise a day or a week, but the actual level of that person as concerns aerobic and anaerobic fitness, strength, mobility, balance and adiposity. And this because it does not matter at all that a person says he/she regularly practices sports or physical activity, and complies with recommendations, while those declarations are not validated by Eurofit assessments. On the other hand, if these tests were periodically administered and their results were recorded on specially designed fact sheets/ cards, and then analysed in evolution together with the physician [*], this would increase the interest of individuals in physical activity and its effects. Practically, everybody and especially adults and elderly people would become concerned, even anxious - positively speaking - about the testing results and their evolution, as it happens with the values of cholesterol, glycaemia, etc. With the difference that in the last case, values depend to a significant extent on genetic heritage/ancestry, while in the case of physical tests, they will depend in a greater proportion on what the individuals really do for their improvement. Thus, a benefit would be obtained even from the competitive nature of the human being and from the propensity to stand out, to boast and to amaze, which is a general characteristic and desire of individuals.

The hope that this type of amendments would generate a stimulating and contaminant effect is based on the thought that the weak interest in physical activity could also be explained by the too vague, only orientative guidelines and recommendations usually delivered to people - "Exercise 30 min every day"! for instance - and by the absence of concrete reference points, of clear figures for evidencing the progress of a person after he/she has adopted an active lifestyle.

Therefore, in our opinion, at the moment there is already enough knowledge and information about physical activity and its benefits, so that the time has come to make the leap to the next phase of approaching and implementing this health factor in the daily life of people. More concretely, we are convinced that it is no longer time to spend money, imagination and time on research, or for launching literature and recommendations, for collecting and spreading good practice examples, etc. Instead, all financial, organisational and any other type of resources and efforts have to be concentrated on the real involvement of people in physical activity and on dynamically evidencing the effects of an active lifestyle at the level of individuals.

[$] It is to be specified that the initiatives and publications generated by EU are much more numerous than the number of items included in this bibliography, so that we are facing a really very bushy and redundant welter within which only with great effort and considerable consumption of time you can find your way.

[#] This type of monitoring would have to become a rule even more rigorously respected than that of periodic examination, sometimes formally accomplished by occupational medicine physicians.

[*] It is more and more obvious that physicians need to acquire essential knowledge about physical activity and to use it in their daily activity.

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Aflaţi în faţa unei realităţi atât de grave, precum cea descrisă în editorialul din numărul trecut al revistei noastre (Dumitru, 2016), să vedem ce au făcut şi ce-şi propun să facă în continuare OMS Europa şi UE, deci şi Romania. Nu vom merge prea mult înapoi în timp, şi vom începe cu un proiect în care s-au pus extrem de multe speranţe, deoarece a reprezentat voinţa şi angajamentul tuturor miniştrilor sănătăţii din cele 53 de ţări ale Regiunii Europene OMS; este vorba de *„Carta europeană privind contracararea obezităţii"* (2), de la a cărei semnare se împlinesc 10 ani în noiembrie 2016. Printre altele, în Cap.3, intitulat „Monitorizarea progreselor", această cartă prevedea că „un prim raport privind evoluţia obezităţii va fi redactat după 3 ani de aplicare a *Cartei*.

Raportul a fost prezentat de către Zsuzanna Jakab (directorul OMS Europa), în 8 decembrie 2010 (12), şi reprezintă o mostră de document birocratic, care nu spune practic nimic din ceea ce ar fi trebuit să spună. Astfel, din cele 18 slide-uri, unul singur - al 7-lea - se referă la tendinţele identificabile în ce priveşte incidenţa supraponderalităţii adulţilor, graficele şi cifrele îndicând că, cu puţine excepţii, în majoritatea ţărilor aceasta a crescut, inclusiv după adoptarea *Cartei*... În rest, o înşiruire de date

constatative mai mult sau mai puţin noi, şi nimic despre cauzele care ar fi făcut ca în peste 3 ani să nu se perceapă efectele *Cartei,* nimic despre corecţiile sau completările care se au în vedere şi, surprinzător, nimic despre un nou, viitor raport. Lucru până la urmă explicabil, de vreme ce încă de la început, doamna Jakab s-a văzut obligată să anunţe că raportat la anul 2006, când a fost adoptată *Carta*, „s-au realizat anumite progrese, însă adevărul este că în multe ţări obezitatea continuă să crească"(2).

După cum se ştie, *Carta* a fost iniţiată şi coordonată de OMS Europa, al cărui organism specializat pentru activitatea fizică - factor care ne interesează pe noi în primul rând, în acest editorial - este HEPA Europe; *Reţeaua europeană de promovare a activităţii fizice care îmbunătăţeşte sănătatea* (6). Obiectivele şi principiile după care se ghidează HEPA Europe sunt, desigur, perfect raţionale şi generoase, iar dacă vizitezi insistent site-ul reţelei vei găsi o pletoră de informaţii şi documente privitoare la acţiunile, activităţile, proiectele şi instrumentele de lucru pe care diversele grupuri de lucru (9 în total) le-au iniţiat şi dus la îndeplinire din mai 2005, când a fost fondată, şi până azi. Nici o referire clară însă, la cel mai important aspect şi, în fond, la raţiunea de a fi a HEPA; impactul pe care activitatea reţelei şi producţiile sale l-a avut asupra procentului celor care practică cu regularitate exerciţiul fizic, sportul.

Dar, parcă pentru a mai valida odată zicala referitoare la „copilul cu mai multe moaşe…", UE, practic Consiliul Europei şi Comisia Europeană, au avut şi au şi ele extrem de numeroase iniţiative, planuri, proiecte, programe, acţiuni şi „instrumente", pe care le-au tot multiplicat-amplificat, şi le-au finanţat cu dărnicie. O foarte bună şi utilă imagine asupra celor 20 cele mai importante proiecte pe care le-a finanţat UE între 2008 şi 2013, în problemele nutriţiei şi activităţii fizice, ca factori de reducere a obezităţii, ne-o oferă o sinteză de 78 pagini (13), publicată în 2014. Un material discret onest, pe care parcurgându-l realizezi pe de o parte, ce sume şi ce forţe umane specializate imense au fost mobilizate, iar pe de altă parte că, în fapt, rezultatele efective sunt cele pe care ni le arată datele statistice nesatisfăcătoare reţinute în editorialul anterior (Dumitru, 2016). Un document care te îndeamnă să îţi spui, cu indignare chiar: „dacă într-un domeniu relativ îngust, cum este acela al alimentaţiei şi activităţii fizice ca factori de ţinere sub control a obezităţii, lucrurile stau aşa, ce dimensiuni pot avea birocraţia, formalismul şi cheltuielile inutile/ineficiente, la nivelul întregii Comunităţi Europene ?"

Lectura paginilor de început (6-13) ale sintezei despre care vorbim (13), este foarte instructivă şi pentru a accede cât de cât, la logica întregului eşafodaj autoproliferant [$] – probabil din ce în ce mai greu de stopat - de strategii (11), înalte grupuri de lucru (7), planuri de acţiune (1), programe de sănătate - cel în curs (3) urmând să ţină până în 2020 - şi moduri de colaborare cu OMS Europa. Eşafodaj pe care guvernul UE (Comisia Europeană) l-a tot amplificat - neoplazic, am putea zice - începând din martie 2005, când a fost lansată *Platforma UE privind alimentaţia, activitatea fizică şi sănătatea* (4). Înţelegem din aceste pagini că răspunsul Comisiei la marea problemă a supraponderalităţii şi obezităţii, a fost adoptarea, în 2007, a „*Strategiei pentru Europa privind alimentaţia, supragreutatea şi problemele de sănătate generate de obezitate*" (11), iar principalele instrumente de lucru concepute pentru implementarea ei sunt „*Platforma de acţiune...*"(4) şi „*Grupul (de lucru) la înalt nivel privind alimentaţia şi activitatea fizică*" (7). Foarte recent (2014) *Grupul* lansând „*Planul de acţiune asupra obezităţii la copii*" (68 de pagini) (1), prin care îşi propune „să stopeze creşterea supraponderalităţii şi obezităţii la copii şi tineri (0 - 18 ani), până în 2020". Obiectiv lăudabil, dar total nerealist, după opinia noastră, de vreme ce se apelează la aceleaşi strategii diluate şi evazive, care şi-au dovedit deja ineficienţa.

Ultima iniţiativă UE pe care o vom semnala în prezentul material, este o nouă „excrescenţă" (de data aceasta a *Planului de actiune)*, care se numeşte „*Acţiunea comună pentru nutriţie şi activitate fizică*" (10). Lansat la 1 sept 2015 şi programat să se deruleze pe parcursul a 27 de luni, acest proiect nu aduce nimic nou ci, la fel ca multe altele, îşi propune doar să colecteze date. Şi, ca de obicei, deşi o include în titulatură, ignoră practic activitatea fizică.

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Exprimarea noastră făţiş şi programat critică, plină de neîncredere la adresa recentelor iniţiative şi măsuri lansate de UE şi OMS Europa, se justifică prin rezultatele la care au condus până acum idei şi programe de aceeaşi factură. Iar unele (nu toate, din păcate !) dintre cauzele care au stat la baza ineficienţei incriminate, au fost identificate de o evaluare externă independentă (5) a implementării „*Strategiei pentru Europa privind alimentaţia*". Un fel de audit, cam diluat şi el, o oglindă ceva mai realistă a situaţiei, în care, totuşi, dacă birocraţii de la UE şi OMS Europa s-ar privi cu sinceritate, tot ar însemna ceva, poate.

Concluziile esenţiale ale *Evaluării* sunt că există anumite rezultate pozitive, nu prea notabile însă, şi că se impune acordarea unei atenţii mai mari promovării activităţii fizice. Care a fost evident neglijată până acum, în primul rând datorită componenţei dominate de medici, a diverselor foruri şi organisme. Altfel spus, per total, după 5 ani de la adoptarea „*Strategiei*", rezultatele sunt neconvingătoare şi nedătătoare de mari speranţe, dacă ne raportăm la amploarea fenomenului obezităţii şi la marea lui inerţie. Explicaţiile ţin de faptul că majoritatea acţiunilor întreprinse au fost „blânde" (soft), lipsite de consistenţă, şi s-au bazat în primul rând pe oferirea de materiale educative, pe intervenţii restrânse ca impact (la nivelul şcolilor, de exemplu), şi pe acţiuni voluntare. Asta în condiţiile în care - se precizează în *Evaluare* - există opinii care pledează pentru măsuri mai viguroase şi pentru reguli mai ferme (inclusiv reglementări fiscale), de combatere a supraponderalităţii şi obezităţii.

Exprimându-şi franc neîncrederea în privinţa capacităţii Comisiei Europene de a implementa asemenea măsuri, *Evaluare* (5) trage totodată şi un necesar semnal de alarmă, când spune: „este evident şi imperios necesar să se ia decizii mai concrete, mai viguroase, iar urmărirea ducerii lor la îndeplinire să fie făcută cu mai mare rigoare, întrucât fără un nou impuls există riscul ca interesul şi preocuparea UE să scadă pentru această problematică". De altfel, materialul avertizează asupra evidentelor „semne de inerţie/rutină şi lipsă de iniţiativă/imaginaţie", care pot fi identificate deja, atât în activitatea *Grupului la Nivel Înalt*

(7), cât şi în cea a *Platformei* (4).

Dacă aşa stau lucrurile la nivelul UE, ele nu au cum să stea mai bine în România, realitate inspirat sugerată şi de titlul unui material foarte recent (9). Situaţia este valabilă pentru tot ce ţine de bolile netransmisibile şi, potrivit prof. R. Cherecheş (directorul Şcolii de Sănătate Publică din Cluj), se explică atât prin ne-ratificarea tuturor politicilor şi recomandărilor organismelor europene şi internaţionale, cât şi prin ne-implementarea celor de bine de rău ratificate (9).

Cât priveşte aspectele specifice, adică minusurile (pentru că de plusuri nu poate fi vorba !) „luptei" cu obezitatea în Romania, ele ar merita un demers analitic mult mai profund şi mai sistematic. Dar întrucât prezentul material nu-şi propune aşa ceva, vom menţiona aici doar faptul că tot ce ar urma să se întreprindă până în 2020, ar trebui să îşi aibă raţiunea şi originea, în „*Planul multianual integrat de promovare a sănătăţii şi educaţiei pentru sănătate...*" (8). Acest plan, care acoperă perioada 2016 - 2020, a fost însă lansat abia în 24.02.2016 (!?); deci la două luni după ce el ar fi trebuit să înceapă „să lucreze". Ce să mai spunem de Comisia Naţională respectiv Comisiile Judeţene de implementare a lui, care vor fi constituite cine ştie când.

Mai există şanse ca inactivitatea fizică şi obezitatea să fie reduse semnificativ ? Şi dacă da, ce ar trebui făcut ?

După atâta timp pierdut şi după atâtea încercări care s-au dovedit falimentare, ar fi cazul să se conştientizeze acut că a venit vremea să răspundem tranşant la prima întrebare, şi mult mai imaginativ-creator şi mai realist-adecvat, la a doua. Lucru posibil însă doar după ce se va întreprinde o analiză foarte dură - mult mai dură decât Evaluarea din 2013 (5) - a situaţiei. O analiză lipsită de orice fel de partipriuri, menajamente şi escamotări ale realităţii, şi care să ia în discuţie atât principiile care au stat la baza strategiei de până acum, cât şi metodele şi mijloacele concrete, propuse şi puse în practică. Totul nu doar din perspectiva raportului cost-beneficiu, ignorată până acum, ci şi din aceea a plasării în cruda realitate, că ne cam aflăm în faţa ultimei şanse de a evita o catastrofă biologică a singurei fiinţe raţionale, cum îi place omului să se pretindă a fi; şansa de a inversa o evoluţie care, dacă nu va fi întreruptă, va duce mai mult ca sigur, şi ireversibil, la degenerarea fizică a rasei umane.

Desigur, din postura din care ne exprimăm, nu putem lansa prea multe sugestii viabile, eficiente. Ne luăm totuşi îndrăzneala să avansăm ideea că, pentru a spera la altfel de rezultate decât cele de până acum, în războiul „pe viaţă şi pe moarte" cu inactivitatea fizică şi obezitatea, s-ar impune cel puţin trei modificări importante de abordare.

Prima ţine de principii, este sugerată inclusiv de raportul final al „*Evaluării"* (5), de care vorbeam mai sus, şi ar presupune ca - strict, şi exclusiv în problemele ce au legătură cu sănătatea individului - drepturile omului să fie completate şi contrabalansate de obligaţiile lui. Fără a intra în detalii, asta ar presupune crearea unui cadru legislativ şi social, care să favorizeze-stimuleze-forţeze responsabilizarea fiecăruia pentru propria sănătate, şi pentru consecinţele stilului de viaţă pe care, în perfectă cunoştinţă de cauză, îl adoptă.

Cea de-a doua modificare de abordare este de natură esenţialmente organizatorică şi ar presupune separarea de urgenţă, şi completă, a preocupărilor, măsurilor, competenţelor şi responsabilităţilor ce vizează alimentaţia sănătoasă, de cele care au în vedere şi ţintesc în mod specific adoptarea unui stil activ de viaţă, bazat pe mişcare, deci renunţarea la inactivitatea fizică. Caz în care, cu promovarea şi implementarea activităţii fizice ar trebui responsabilizaţi medici cu apetit şi expertiză în domeniu, ajutaţi de specialişti în exerciţiul fizic.

În sfârşit, cea de-a treia propunere vine în completarea şi în sprijinul celei precedente, şi se referă la instrumentele cu care se lucrează în colectarea datelor referitoare la incidenţa sedentarismului sau, cu alte cuvinte, pentru evaluarea şi monitorizarea [#] nivelului actual de activitate fizică al populaţiei. Mai concret, credem că este cazul să se înlocuiască adimistrarea de chestionare, cu bateriile de teste Eurofit (sau cu altele, deşi s-au cheltuit foarte mulţi bani cu acestea), ignorate practic de campaniile şi programele de promovare a activităţii fizice în UE. Această modificare de abordare ar fi benefică întrucât, ceea ce contează în ultima instanţă nu este numărul de minute de activitate fizică declarate a fi efectuate pe zi/săptămână, ci cum stă efectiv persoana în cauză, în planul capacităţii aerobe şi anaerobe de efort, al forţei, mobilităţii, echilibrului şi compoziţiei corporale. Degeaba cineva spune că practică în mod regulat activitatea fizică, şi îndeplineşte recomandările existente în această privinţă, dacă afirmaţiile respectivului nu sunt validate de rezultatele etalate în cadrul testărilor de genul celor din Eurofit. Pe de altă parte, administrând aceste teste şi consemnând rezultatele lor în fişe/carnete special concepute, păstrate „la purtător" dar analizate (şi) cu medicul [*], ar creşte şi interesul persoanelor în cauză pentru activitatea fizică şi pentru efectele sale. Aceasta întrucât fiecare ar deveni preocupat de rezultatele testărilor şi de evoluţia lor, aşa cum se întâmplă în cazul colesterolului, al glicemiei etc; ale căror valori ţin însă, într-o importantă măsură, de zestrea genetică. Or, dat fiind că rezultatele la testele Eurofit ţin în mult mai directă măsură de ceea ce face efectiv individul pentru îmbunătăţirea lor, s-ar „exploata", în sensul dorit, natura funciarmente concurenţială şi dorinţa de a se remarca, a epata (se lăuda), caracteristice fiinţei umane în general.

Speranţa că aceste modificări ar putea avea un efect stimulativ, contaminant, are la bază raţionamentul că interesul slab de până acum pentru activitatea fizică, se datorează şi îndrumărilor şi recomandărilor prea vagi, orientative, care li se livrează de regulă oamenilor (de exemplu: „faceţi 30 minute mişcare în fiecare zi" !), şi lipsei de repere concrete, cifrice, ale progreselor pe care efortul lor de a adopta un stil activ de viaţă, le generează.

Prin urmare, considerăm că în momentul de faţă există suficiente cunoştinţe şi informaţii cu privire la tot ce ţine de activitatea fizică şi beneficiile ei, încât să se facă saltul la o nouă fază de abordare şi de implementare, în viaţa de zi cu zi a oamenilor, a acestui factor de sănătate şi de luptă împotriva obezităţii. Mai concret, avem convingerea că a venit vremea să nu se mai cheltuie bani pentru cercetări, pentru redactarea de nateriale şi instrucţiuni, pentru colectarea şi răspândirea de bune practici etc., iar

tot efortul financiar, organizatoric şi de orice altă natură, să se concentreze pe angrenarea efectivă a oamenilor în activitatea fizică, şi pe evidenţierea în dinamică a efectelor stilului activ de viaţă, la nivel de individ.

[$] Precizăm că numărul iniţiativelor şi materialelor generate de UE în problematica de care ne ocupăm, este cu mult mai mare decât numărul surselor pe care le-am reţinut în această bibliografie, astfel încât avem de-a face cu un realmente foarte stufos şi redundant hăţiş, în care doar cu foarte mare dificultate şi considerabil consum de timp te poţi orienta.

[#] Acest tip de monitorizare a tuturor cetăţenilor, indiferent de vârstă şi statut social, ar trebui să devină o regulă, mai strictă chiar decât cea a exemenelor periodice - de multe ori formale - efectuate de specialiştii în medicina muncii.

[*] Este o necesitate tot mai evidentă ca medicii să capete cunoştinţe de bază referitoare la exerciţiului fizic, şi să le aplice în activitatea curentă.

References

Dumitru,G. Inactivitatea fizică ucide (I). Palestrica of the third Millennium-Civilization and sport 2016;17(2):97-102.

Websites (all accessed in May 2016)

(1) EU Action Plan on Childhood Obesity 2014-2020. 24 February 2014 [updated 12 March and 28 July 2014]. Available online from http://ec.europa.eu/health/nutrition_physical_activity/docs/childhoodobesity_actionplan_2014_2020_en.pdf
(2) European Charter on counteracting obesity. The WHO European Ministerial Conference on Counteracting Obesity (Istanbul, Turkey, 15–17 November 2006). Available online from http://www.euro.who.int/__data/assets/pdf_file/0009/87462/E89567.pdf
(3) EU Health Programme 2014-2020. Available online from http://ec.europa.eu/health/nutrition_physical_activity/high_level_group/index_en.htm
(4) EU Platform for Diet, Physical Activity and Health. 15 March 2005. Available online from http://ec.europa.eu/health/archive/ph_determinants/life_style/nutrition/platform/docs/platform_charter.pdf
(5) Evaluation of the implementation of the Strategy for Europe on Nutrition, Overweight and Obesity related health issues. FINAL REPORT. 29 April 2013. Available online from http://ec.europa.eu/health/nutrition_physical_activity/docs/pheiac_nutrition_strategy_evaluation_en.pdf
(6) HEPA Europe (European network for the promotion of health-enhancing physical activity). Available online from http://www.euro.who.int/en/health-topics/disease-prevention/physical-activity/activities/hepa-europe
(7) High level group on nutrition and physical activity. Available online from http://ec.europa.eu/health/nutrition_physical_activity/high_level_group/index_en.htm
(8) Planul Multianual Integrat de Promovare a Sănătăţii şi Educaţie pentru Sănătate (pentru perioada 2016 – 2020). Available online from http://www.ms.ro/upload/plan-integrat-tipar_mic-ultima-versiune.pdf
(9) Politicile româneşti de prevenire a bolilor cronice netransmisibile-forme fără fond. Available online from http://euro-health.ro/politicile-romanesti-de-prevenire-a-bolilor-cronice-netransmisibile-forme-fara-fond/
(10) The Joint Action on Nutrition and Physical Activity – JANPA. A European collaborative action to stop the rise of overweight and obesity in children and adolescents by 2020. Sept. 2015. Available online from www.janpa.eu
(11) White Paper on a Strategy for Europe on Nutrition, Overweight and Obesity related health issues. 30.05. 2007. Available online from http://ec.europa.eu/health/ph_determinants/life_style/nutrition/documents/nutrition_wp_en.pdf
(12) WHO progress report on the implementation of the European Charter on counteracting obesity. December, 8, 2010. Available online from http://www.euro.who.int/en/about-us/regional-director/speeches-and-presentations-by-year/2010/who-progress-report-on-the-implementation-of-the-european-charter-on-counteracting-obesity
(13) 2008-2013 EU funded actions to support the EU Public Health priorities Nutrition and Physical Activity Actions addressing Obesity. Available online from http://ec.europa.eu/health/nutrition_physical_activity/docs/nutrition_fundedactions_2014_en.pdf

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Complex rehabilitation in females with fibromyalgia
Program de recuperare complex la femeile cu fibromialgie

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Abstract

Background. Fibromyalgia (FM) is one of the most common soft tissue conditions characterized by pain and associated with substantial disability. After osteoarthritis, it is the most common cause for a medical consultation.

Aims. We evaluated in our study the efficacy of a complex rehabilitation program, based on an 8 weeks home aerobic training, for reducing pain and associated symptoms and improving the quality of life in females with fibromyalgia.

Methods. 46 females diagnosed with FM by ACR criteria were randomized into two groups: group 1 – 24 patients (G1) was treated by complex therapy (patient education, stress reduction, medications, and regular aerobic exercise - an 8 weeks home training program), and group 2 – 22 control patients (G2) received only pharmacotherapy. The measured parameters were: the number of tender points, pain (visual analogue scale), Spitzer Quality of Life Index (SQLI) and Fibromyalgia Impact Questionnaire (FIQ).

Results. The mean value of FIQ was improved ($p < 0.05$) and the improvement in G1 was significantly higher than in G2 ($p < 0.01$). VAS scores for pain were reduced in all patients; this reduction was significantly higher in G1. The number of tender points for patients in G1 decreased significantly more than for those in G2.

Conclusions. Exercise programs in shorter daily schemes can lead to long-term success, especially for quality of life and clinical status. Treatment programs are most effective when they combine patient education, stress reduction, regular exercise, and medication. Background. Fibromyalgia (FM) is one of the most common soft tissue conditions characterized by pain and associated with substantial disability. After osteoarthritis, it is the most common cause for a medical consultation. An interdisciplinary medical team is the best option for assistance in FM patients.

Key words: fibromyalgia, individualized kinetic program.

Rezumat

Premize. Fibromialgia (FM) este o condiţie cronică caracterizată prin durere, redoare, senzaţie de greutate la nivel muscular, fatigabilitate, cu dizabilitate marcată. După boala artrozică, este cea mai frecventă cauză pentru consultul medical.

Obiective. Studiul randomizat controlat a fost derulat cu scopul de a evalua eficacitatea programului de recuperare, bazat pe exerciţiu fizic aerob (home-training), în asistenţa medicală a femeilor cu FM.

Metode. 46 femei diagnosticate cu FM au fost randomizate în două loturi: lot 1 (L1) – 24 paciente care au primit un program complet individualizat (măsuri educaţionale, reducerea stresului, medicaţie, home-training – program de exerciţii aerobe, derulate 8 săptămâni); lot 2 (L2) – 22 paciente care au primit doar medicaţie. Parametrii măsuraţi au fost numărul punctelor tender, durerea (scala vizual analogă - VAS), scorul Spitzer Quality of Life Index (SQLI) şi scorul scalei Fibromyalgia Impact Questionnaire (FIQ).

Rezultate. Scorul scalei FIQ s-a ameliorat pentru ambele loturi, semnificaţie statistică având modificarea pentru L1 ($p < 0.01$). Scorul scalei VAS s-a îmbunătăţit pentru toate pacientele, cu semnificaţie statistică tot pentru L1. Numărul punctelor tender pentru L1 a scăzut semnificativ, comparativ cu evoluţia celor din L2.

Concluzii. Programul cotidian de exerciţii fizice aerobe a permis o ameliorare semnificativă a parametrilor studiaţi, cu precădere pentru calitatea vieţii şi statusul clinic. Programele de terapie în FM sunt mult mai eficiente când se combină măsurile educaţionale, reducerea stresului şi kinetoterapia cu medicaţia. Echipa medicală interdisciplinară reprezintă opţiunea ideală care să performeze aceste programe de terapie la pacienta cu FM.

Cuvinte cheie: fibromialgia, program kinetic individualizat.

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Introduction

Fibromyalgia (FM) – a chronic idiopathic non-articular condition defined by widespread musculoskeletal pain, which is believed to involve genetic, psychological, and environmental factors (Wolfe & Rasker, 2012), is one of the most common soft tissue pain conditions associated with substantial disability seen in medical practice and the most common reason of visits to the physiatrist, after osteoarthritis. It predominantly affects women (over 80 percent) between the ages of 35 and 55. Rarely, fibromyalgia can also affect men, children, and the elderly (Di Franco et al., 2011; Wolfe et al., 2013).

Etiology is unknown and pathogenesis is unclear (Clauw & Crofford, 2003). A dysfunctional pain modulation system represents the principal explanation for central pain described in FM. There is an increased incidence of fibromyalgia among certain populations with genetic polymorphisms affecting serotonergic and catecholaminergic systems. Central sensitization is the most important central nervous system aberration in FM, with altered neurotransmitters in serum (decreased serotonin) and central system fluid (increased substance P). Nociceptive impulses reach the brain unimpeded by the usual action of the descending nociceptive inhibitory control system (Ge et al., 2011; Alonso-Blanco et al., 2011; Affaitati et al., 2011). As a consequence, patients with FM usually complain of widespread body ache with associated fatigue, anxiety, depression, restless sleep, morning stiffness and awakening feeling tired, headache, tingling/numbness, cognitive disturbance, etc. (Alonso-Blanco et al., 2011; Wolfe & Rasker, 2012).

Fibromyalgia has 2 major components: chronic widespread pain and a set of somatic symptoms. Among FM patients, these components are expressed on a continuum, with one end of the spectrum being heavily weighted toward chronic widespread pain and the other end being largely a somatic symptom disorder (Wolfe et al., 2013).

The prevalence of FM varies in different countries. It can occur independently - primary FM, or it can be associated with another disease, such as systemic lupus or rheumatoid arthritis - FM syndrome (Podell, 2007).

Fibromyalgia can be thought of as widespread myofascial pain; such patients have multiple myofascial tender points (TeP). The term tender point is also used to serve as a diagnostic marker for the diagnosis of fibromyalgia. There is now good evidence that such patients have an abnormality in their central processing of both pain sensations (hyperalgesia) and non-pain sensations (allodynia).

Fibromyalgia tender point pain may vary depending on time of day, weather, physical activity, presence of stressful situations, and often proves to be more intense after disturbed sleep; when pressed, the pain is increased without irradiation, and during palpation the node is not determined.

Tender points are extremely sensitive points on the body, painful with compression weighing four kilograms. These tender places occur symmetrically on both sides of the body (Fig. 1):

- occiput: bilateral, at the suboccipital muscle insertions;
- low cervical: bilateral, at the anterior aspects of the intertransverse spaces at CV–CVII;
- trapezius: bilateral, at the midpoint of the upper border;
- supraspinatus: bilateral, at origins, above the scapular spine near the medial border;
- second rib: bilateral, at the second costochondral junctions, just lateral to the junctions on upper surfaces;
- lateral epicondyle: bilateral, 2 cm distal to the epicondyles;
- gluteal: bilateral, in upper outer quadrants of buttocks in anterior fold of muscle;
- greater trochanter: bilateral, posterior to the trochanteric prominence;
- knee: bilateral, at the medial fat pad proximal to the joint line (Wolfe, 1990).

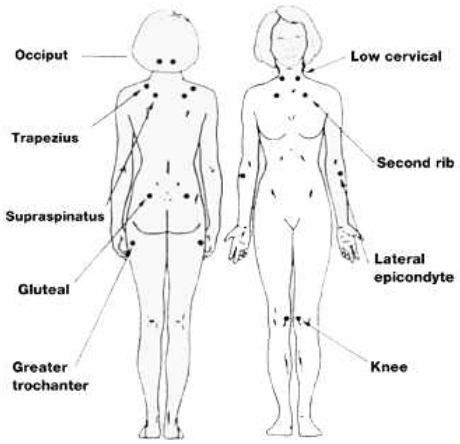

Fig. 1 – Tender points in FM patients.

Diagnosing FM can be difficult because it encompasses a very wide range of symptoms that can be confused with those of other disorders (fatigue, headache, irritable bowel syndrome, sleep disturbances, paresthesia, muscle weakness, bladder dysfunction, depression, anxiety) (Di Franco et al., 2011). FM may accompany rheumatic disorders such as rheumatoid arthritis, systemic lupus erythematosus and Sjogren's syndrome (Almodovar et al., 2010; Azevedo et al., 2010).

There is no cure for this disorder, and most patients can be expected to be symptomatic for many years, with a reduced quality of life and varied levels of psychosocial dysfunction. However, engagement in a productive lifestyle and minimization of dysfunction can often be achieved. The treatment plan should cover at least the following main problem areas: pain, sleep quality, how patients and family are coping with the distress of this chronic illness, exercise (i.e., conditioning), and whether depression and/or anxiety have developed. Although there are no guidelines for treatment, there is evidence that a multidimensional approach with patient education, cognitive behavior therapy, exercise, physical therapy, and pharmacological therapy can be effective (Chakrabarty & Zoorob, 2007). The beneficial effect of aerobic exercise in the management of FM has been reported (Vierck et al., 2001; Chakrabarty & Zoorob, 2007). A gentle program of stretching and aerobic exercise is essential to counteract the tendency for deconditioning that leads to progressive

Table I
Patient biographical data and mean values of studied parameters.

Parameters		VAS1	VAS2	FIQ1	FIQ2	SQLI1	SQLI2	NO1	NO2
G 1	24 females, age (years) limits 48.5 ± 3.002 (42-53), 15 urban/9 rural								
	Mean	6.50 #	2.73 #	62.59 #	53.86 #	4.82 *	3.18 *	14.14 #	11.64#
	SD	.859	.894	3.581	4.649	.733	.590	1.320	.921
G 2	22 females, age (years) limits 49.75 ± 4.005 (41-54), 14 urban/8 rural								
	Mean	6.45 *	3.68 *	63.55 *	56.91 *	5.82	4.83	14.14 *	12.91 *
	SD	1.011	.631	3.595	3.482	.907	.733	1.356	.658

Legend
VAS = visual analogue scale; FIQ = Fibromyalgia Impact Questionnaire;
SQLI = Spitzer Quality of Life Index, NO = number of tender points, SD = standard deviation;
1 = before the rehabilitation program, 3 = after 10 weeks, when the rehabilitation program was complete;
* correlation is significant at the 0.01 level
# correlation is significant at the 0.001 level (Pearson correlation).

dysfunction in FM patients. Before stretching, muscles should be actively warmed by gentle exercise. The European League Against Rheumatism (EULAR), in newly revised recommendations, highlights exercise as the strongest evidence-based therapy to manage fibromyalgia. These guidelines favor non-pharmacological approaches as an initial treatment, with more personalized therapies in cases of non-response that may include medications. Although evidence in the literature was poor, the committee felt that given the safety and benefit of exercise to general health, exercise should be included as a recommendation (Carville et al., 2007).

Hypothesis

Taking into consideration the previous recommendations for FM management, we evaluated in our study the efficacy of a complex rehabilitation program, based on 8 weeks home aerobic training, for reducing pain and associated symptoms and improving the quality of life in females with fibromyalgia.

Material and methods

We mention that we obtained the approval of the Ethics Committee of the University of Medicine and Pharmacy of Craiova No 19/26.02.2016 and a signed informed consent from all the subjects participating in our study. Our research was performed on 46 female patients, all diagnosed with primary fibromyalgia.

Research protocol

a) Period and place of the research

We conducted our study during the period March 2016 - July 2016 in the Rehabilitation Department of the "Filantropia" Hospital Craiova.

b) Subjects and groups

The study was a randomized controlled trial including two groups of females (G1 – study group and G2 – control group), homogeneous in terms of biographical, clinical and functional features (Table I).

The diagnosis is made on clinical ground based on patient history and physical examination. None of them had any previous disease. We took into consideration the American College of Rheumatology (ACR) criteria for FM, established in 1990 and 2010. The 1990 ACR diagnostic criteria established the extent of tenderness by palpation at 18 predetermined sites. Symptoms and co-morbid conditions were not used in the diagnosis of fibromyalgia, although their association with fibromyalgia was widely understood. In its 2010 modifications, the ACR eliminated palpation as a diagnostic criterion.

Clinicians scored the modified ACR 2010 diagnostic criteria in one of 2 ways (Table II). Both approaches score the WPI and the SS scale separately and then add the results (Ferrari & Russell, 2013).

Table II
The modified ACR 2010 diagnostic criteria for FM

	Bilateral sites (total of 14)	Unilateral sites (total of 5)
Potentially painful locations based on the Widespread Pain Index, modified ACR 2010 fibromyalgia diagnostic criteria ACR	Jaw Shoulder Upper arm Lower arm Hips Upper leg Lower leg	Neck Upper back Chest/breast Abdomen Lower back
	Widespread Pain Index scoring: The patient identifies the presence of pain in any of the 19 areas specified. Score will be between 0 and 19	
Symptom Severity scale items in the modified ACR 2010 fibromyalgia diagnostic criteria ACR	Items related to fatigue, cognitive difficulties, and sleep disturbances Fatigue Trouble thinking Waking up tired	Items related to specific symptoms Abdominal pain or cramps Depression Headache
	Items that are not scored but exclude transient illness and other conditions, such as cancer or lymphoma Symptom duration of ≥3 months The patient does not have a disorder that would otherwise explain the pain Symptom Severity scale scoring: The patient rates each item 0 (not present) to 3 (severe).	
The presence of fibromyalgia if: Widespread Pain Index ≥7 and Symptom Severity scale score ≥5, or Widespread Pain Index 3-6 and Symptom Severity scale score ≥9		

c) Tests applied

We completed an initial etiopathogenic, clinical, laboratory (laboratory screening, imaging examination - radiography and ultrasound) and functional assessment.

The *etiopathogenic* and *clinical assessment* included:

- careful patient history to determine pain parameters, accompanying symptoms (mentioned in Table II);
- general physical examination (system examination including sensory evaluation);
- musculoskeletal examination - somatoscopic exam, assessment of the range of motion and manual muscle testing, tender points (all patients had at least 12 tender

points).

During the examination, we conducted *laboratory* tests and *ultrasound* to highlight the most important tender points. For the ultrasound examination, we used a HD 11 XE Ultrasound System Philips machine, with a 12.5 MHz probe. US examination was performed after a 20-minute rest in the US evaluation room. We conducted ultrasound examination in three locations - supraspinatus, gluteal (Fig. 2a and 2b) and medial knee - and we described an abnormal muscle pattern, with scratchy hyperechoic aspects (corresponding to the taut band).

For a *functional assessment,* we used the VAS - Visual Analogue Scale (from 0 to 10, 0 = absence of pain and 10 = maximum pain score, other values between 0 and 10 are directly proportional to the intensity of pain, depending on the individual pain threshold), perceived exertion and quality of life (Spitzer scale) and values of the Fibromyalgia Impact Questionnaire (FIQ) to assess the impact of FM on activities of daily living and quality of life.

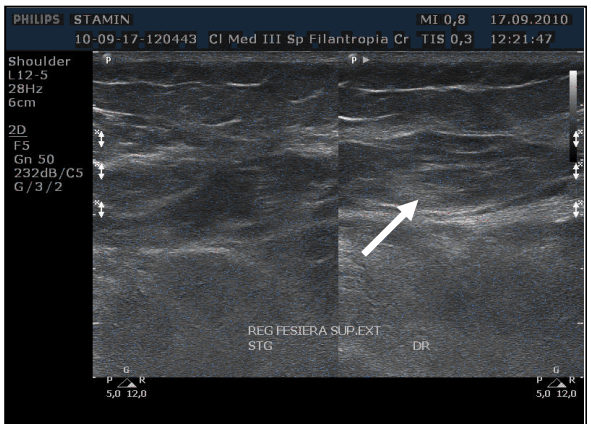

Fig. 2a – Ultrasound aspects for the gluteal area. Scratchy hyperechoic aspects in the right gluteal area (white arrow).

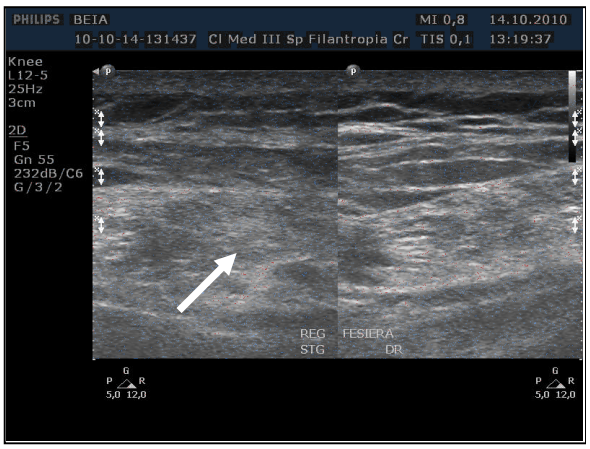

Fig. 2b – Ultrasound aspects for the gluteal area. Scratchy hyperechoic aspects in the left gluteal area (white arrow).

The SQLI (Spitzer Quality of Life Index) is a general Quality of Life index that covers five dimensions of quality of life (activity, daily living, and health, support of family and friends, and outlook). Each dimension is rated on a three-point scale (0 to 2), with a range of scores from 0 to 10. Lower scores reflect better performance (***, 2010).

The FIQ is scored in such a way that a higher score (100 is the maximum possible score) indicates a greater impact of the syndrome on the person. Each of the 10 items has a maximum possible score of 10 (Bennett, 2005).

The clinical evaluation of patients was carried out in three stages - initial (T1), after 2 weeks (T1a) - during which an in-hospital program of rehabilitation was conducted, and after a further 10 weeks (T2) in an outpatient setting. Between T1a-T2, females in G1 followed a home training program (components learned during hospitalization). Functional assessment was made at T1 and T2.

Table III
Exercise program.

Exercise	Description
The first two weeks	Daily kinetic session. 40 minutes duration. Warm-up and cool-down (stretching and active simple mobilization) - 5 min., each. Aerobic exercise (upper and lower limb exercises - Kabat diagonals, cycling) - 30 min.
Home training (8 weeks, performed only in G1 females patients) 5 sessions / week	
Warm-up 5 minutes	A warm-up should begin with gentle joint rotations, starting from your toes and working your way up the body. Perform slow, circular movements (clockwise and counter-clockwise) until all your joints - from toes, ankles, knees, and legs, to hips, trunk, neck, shoulders, elbows, wrists, fingers, and knuckles - move smoothly.
Flexibility exercises	To perform this move: facing a wall, place palms flat on the wall, one foot forward, and one foot back. Leaving heels on the floor, lean forward. As you do so, feel the pull in your calf and the Achilles tendon at the back of the ankle. Hold the position for 30 seconds. Do 5-10 repetitions. Then reverse the position of your legs and repeat.
Strength exercises	Isometric exercises – for chest, upper and lower limbs - With your arms at chest height, press palms together as hard as you can. Hold for 5 seconds; then rest for 5 seconds. Do 5 repetitions. Slowly build to holding the press for 10-15 seconds at a time. - Standing with your back against a wall and your arms at your sides, push your arms back toward the wall with your elbows straight. Hold for 5 seconds, and then rest. Do 10 repetitions. Strengthening exercises using free weights/ handheld weights, elastic bands/ for the flexor muscles of shoulders, elbows and fingers, for the hip muscles, quadriceps and leg flexors. Cycloergometer / 30 minutes, 3-4 times/week.
Cool-down 5 minutes	Stretching, analogue to flexibility exercises, only 2 minutes. Slowly jogging, 3 minutes
Recommendations Respect pain. Listen to your body. Change positions or stop whenever activities cause pain. The intensity of strengthening can be monitored by the percent of one's target heart rate while exercising (the target heart rate is calculated as (220 - age) x 0.7, age represents the number of years) When doing stretching or strengthening exercises, alternate sides often and take a short rest between repetitions. Walking for 30 minute twice daily, if you are OK.	

The healthcare objectives were painful status control and regaining quality of life.

The rehabilitation program was complex and included:

- non-pharmacological measures - educational, dietary and hygienic posture, physical (thermotherapy - paraffin and electrotherapy - magnetodiaflux, TENS, ultrasound), sedative massage and kinetic measures (five times a week for two weeks for both groups, follow-up by an 8 week home training program, only for females in G1; subjects in G2 received no home training program) (Table III);
- specific pharmacological measures - to restore the function of the descending nociceptive inhibitory system using selective gabapentinoids, and other drugs.

d) Statistical processing

The *statistical analysis* was performed using SPSS 12.0 for Windows (Statistical Package for Social Sciences). Standard statistical methods were used to compute the means and standard deviations. We used Pearson's product-moment correlation, the paired t-test and linear regression analysis to compute the correlation and association between the average values of parameters, before and after the rehabilitation program.

Results

The hypothesis that home training can effect improvements in pain, physical function, number of tender points and quality of life is substantiated by the results of our study.

Both forms of management in primary FM patients achieved significant improvements.

For pain, number of tender points and physical function, immediate effects of treatment were obtained in all patients (Table II).

There were correlations between the pre- and post-rehabilitation program mean values for all parameters, with an exception - SQLI. Quality of life presented a significant improvement only for G1. Home training patients showed a significant improvement in the mean pain score compared to the control group, and were significantly more likely to have a 58% reduction in pain from baseline. Improvements in self-reported disability were seen in the home training group (FIQ had a 15% reduction in G1) as compared to the control group (FIQ had only an 8% reduction). The number of tender points for patients in G1 decreased significantly more than for those in G2.

The results of the paired t-test revealed that parameters for G1 increased significantly compared to G2 values (Table IV).

These results were confirmed by linear regression analysis (histograms mentioned in Fig. 3a, 3b and 3c).

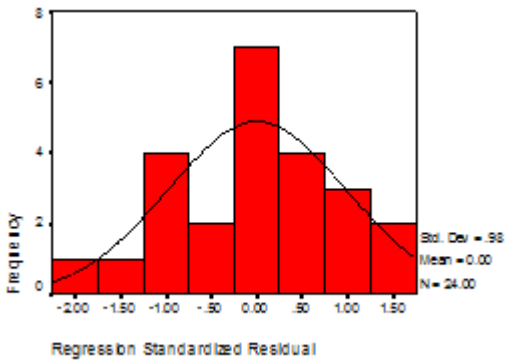

Fig. 3a – The graph frequencies for the VAS parameter (Group 1).

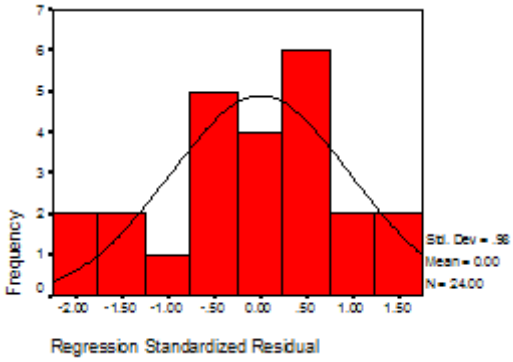

Fig. 3b – The graph frequencies for the FIQ scale (Group 1).

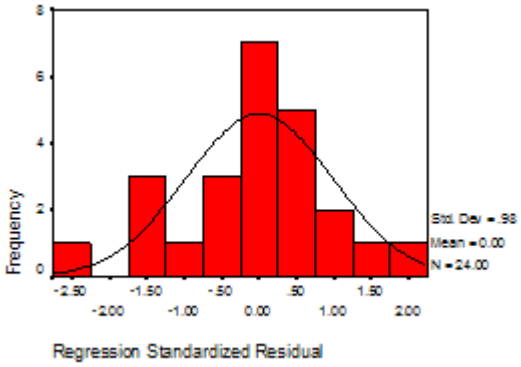

Fig. 3c – The graph frequencies for the NO parameter (Group 1).

Discussions

In our study, we performed a complex rehabilitation program and obtained good results due to a multidisciplinary team of professionals and various modalities individualized for each patient.

Table IV

Mean changes of the studied parameters.

Parameters	Group 1 Mean change (95%CI)	Group 2 Mean change (95%CI)	p * (Group 1 vs Group 2)
VAS scale (10 - 0)	2.82 (2.49 , 3.14)	3.73 (3.31 , 4.14)	< 0.01
FIQ (100 - 0)	4.68 (3.06 , 6.30)	9.68 (8.22 , 11.14)	< 0.01
SQLI (0 - 10)	-1.41 (-1.73, -1.08)	-2.64 (-3.04, -2.24)	0.05
NO	1.23 (0.8 , 1.66)	2.5 (2.07 , 2.93)	< 0.01

* significance p < 0.05; paired t-test

As the literature mentions (Cuatrecasas et al., 2007), our team included a physician, physical therapists and kinetic specialists. The FM female is a member of our team, maybe the most important, because any of the symptoms of FM can occur intermittently and in different combinations for each patient. This complete team applied a complex rehabilitation program, because it is important to treat peripheral sources of pain, such as trigger points, associated with fibromyalgia (Staud et al., 2009).

In our study we used the new ACR criteria because we must understand FM today as a systemic somatic condition based on peripheral pain elements that influence the central nervous system pathways. The emphasis now is on complex symptoms, which has important implications for treatment. So, treatment now emphasizes a graduated exercise program (highly successful in reducing the burden of dysfunction in FM patients) coupled with cognitive behavioral therapies (to address depression and catastrophic thinking and kinesiophobia that alter the work, social, and family-related behavior of the patient) (Busch et al., 2013; Bidonde et al., 2014).

In the last years, more and more studies have mentioned the important role of physical exercises in the complex management of this enigmatic disease - FM:

- Increased physical activity has a positive effect on pain perception in women with fibromyalgia (McLoughlin et al., 2011).

- Pain was the outcome variable that most commonly improved in patients who performed aerobic exercise - one of the non-pharmacological strategies advocated for patients with fibromyalgia. The major goal of this aerobic exercise is to maintain function in everyday activities. Any exercise program should include multiple dimensions: strength, aerobic (endurance) conditioning, flexibility, and balance. Exercise should be of low impact and sufficient intensity to change aerobic capacity (Chakrabarty & Zoorob, 2007).

- Aerobic exercise was associated with improvements in pain and physical function. There is some consistency with regard to aerobic and strengthening exercises, although insufficient evidence to suggest the superiority of one over the other; land and aquatic exercise appear equally effective (Busch et al., 2013; Bidonde et al., 2014).

- Exercise additionally improved sleep quality - by promoting a deep level of sleep (non-REM sleep), fatigue, global measures of improvement and quality of life. A published study that evaluated the impact of a physical therapy-based educational program on patients with FM found that the program had a positive impact on the patients' well-being (Dick et al., 2008).

- Daily aerobic and flexibility exercises may be an essential component of the fibromyalgia rehabilitation program. The goal of these exercises is for the patient to exercise safely without increased pain (Gowans et al., 2004).

- Aerobic-only training has beneficial effects on physical function and some FM symptoms. Strength-only training may improve FM symptoms, but requires further study (Busch et al., 2008a; Thomas et al., 2010).

- Recently, researchers have begun to explore the effects of a wide range of exercise techniques that extend beyond more conventional exercise training modes (e.g., low-impact aerobic training and strength training). Some of the interventions being explored are modeled on long honored holistic approaches used in China and other Asian countries (e.g., tai chi, chi gong, and yoga) or Nordic countries (e.g., Nordic walking); some arise from technologies newly applied to exercise (e.g., vibration); and others represent rethinking the prescriptive approach to physical activity (e.g., lifestyle physical activity) (Busch et al., 2011).

Taking into account that in FM patients, exercise was first recognized to have therapeutic benefits 20 years ago, we applied a complex rehabilitation program based on these exercises. Our results are in accordance with previous trials (Da Costa et al., 2005; Kingsley et al., 2005).

We consider that electrotherapy and massage can help all patients to perform better in the kinetic program. Treatment programs are most effective when they combine patient education, TENS – a useful electrotherapy method, regular exercise, and medications.

As mentioned in Table III, the kinetic program included both strength and flexibility exercises. The exercise parameters (intensity, duration and frequency) were in accordance with the literature data. The order of exercises in the kinetic program respected the set-up: warm-up, flexibility exercises, strengthening with lower resistance levels and cool-down. Our results confirm other studies about the benefits of kinetic programs in FM patients with an exercise regimen that should include the following considerations:

- start at low levels of exercise and progress slowly; progress to stretching all of the major muscle groups; include stretching as part of the exercise cool-down session;
- low-impact aerobic exercise at least 3 times weekly;
- exercise regimen: 4-5 times a week for at least 20-30 minutes each time; may take months to achieve (Jones & Liptan, 2009; Busch et al., 2008b; Nijs et al., 2013).

We considered that strength exercises have benefits on mood and physical functioning (clinical trials have confirmed the benefits of aerobic exercise and muscle strengthening on improvements in fitness, global assessment ratings, and tender-point pain thresholds), but daily aerobic and flexibility exercises are an essential component of the rehabilitation program (Gilliland, 2000).

Patients should begin with a gentle warm-up, flexibility exercises and progress to stretching all of the major muscle groups. Low-impact aerobic exercise is necessary at least 3 times weekly. Patients should always start at low levels of exercise and progress slowly. The goal is to exercise safely without increased pain. 2 patients were not able to achieve the level of exercise; we encouraged them to exercise at the highest level possible without worsening their symptoms, because recent studies have found normal energy metabolism of the muscles and no sign of muscle injuries. So, low-impact aerobic exercises can be performed and be effective in FM (Da Costa et al., 2005; Kingsley et al., 2005).

The rehabilitation program must be individualized for each patient, but the types of exercises in home training remains identical. We recommended to our patients to perform a gentle program of stretching and aerobic

exercise, which is essential to counteract the tendency for deconditioning that leads to progressive dysfunction. Most authors recommend a gradual progression from low intensity exercise, using the "start low and go slow" approach with the goal of achieving at least moderate intensity (Jones & Liptan, 2009; Busch et al., 2008b). We explained patients how and when to use kinetic modalities as part of their maintenance program, to decrease stiffness and pain.

How exercise benefits FM is unknown. Exercise activates endogenous opioid and adrenergic systems, but attenuation of experimental pain by exercise has not been shown consistently (Da Costa et al., 2005).

Taking into consideration the EULAR recommendations for FM treatment, the limitations of our study are:

- Our team did not include a medical psychologist, so none of the patients performed any type of cognitive behavioral therapy (CBT). A number of randomized, controlled trials of multidisciplinary treatment and exercise, combined with education and/or cognitive behavioral therapy, showed that patients with fibromyalgia had improvements on a 6-minute walk, with significant decreases in pain and beneficial efficacy. One randomized, controlled trial of multidisciplinary rehabilitation showed an improvement of health-related outcomes in a nonclinical, community-based setting at 15-month follow-up (Dick et al., 2008). Cognitive behavioral therapy (CBT) techniques emphasize changes in thought patterns and behaviors. It can be performed in a one-on-one or group setting, with beneficial effects achievable in as few as 10 sessions. These techniques have been used in chronic pain treatment programs that manage patients with fibromyalgia. Generally, CBT provided improvements in pain-related behaviors, coping strategies, and overall physical function in a study that reviewed the results of 13 programs using CBT (Ekici et al., 2009).

- Our studied females did not have the possibility of performing aquatic exercise; some investigators believe that aquatic exercise may be the safest and gentlest aerobic conditioning exercise available for this group. Aquatic therapy enables aerobic conditioning and also flexibility, strengthening, and stretching exercise. Aquatic exercise is well tolerated and is especially helpful for some patients (Altan et al., 2004).

- While a recent meta-analysis indicated that aquatic aerobic exercise does not produce superior results compared to similarly intense land exercise, other reviews suggest slight additional benefits in reducing pain and depression with water strengthening and aerobic exercise, and in sleep quality and mood improvement by aquatic aerobic exercise. Exercising in water may be particularly valuable for severely deconditioned individuals or for those with particularly high levels of pain or distress (Jones & Liptan, 2009; Busch et al., 2008b).

- To determine whether a specific fibromyalgia rehabilitation program is superior to non-specific musculoskeletal rehabilitation of patients with fibromyalgia in terms of work disability. The results suggest that in reducing work disability among patients with fibromyalgia, a specific multidisciplinary fibromyalgia rehabilitation program practised in Finland provides no benefit compared with non-specific multidisciplinary musculoskeletal rehabilitation. Further research is needed to develop an optimal program (or several different programs) to control the burden of work disability related to fibromyalgia (Suoyrjö et al., 2009).

Conclusions

1. Optimal treatment in FM females requires a multidisciplinary approach with a combination of medical, analgesic and antidepressant treatment, plus physiotherapy and a kinetic program, tailored according to the status of each patient - pain intensity, function, associated features such as depression, fatigue and sleep disturbance.

2. Patient preferences and available settings should guide exercise prescription.

3. Supervised home training programs, based on a shorter daily scheme, are effective and safe for the complex management of females with FM, especially for quality of life and clinical status.

4. Large, well documented, high-quality studies of exercise interventions to improve exercise adherence and optimize the benefits of exercise and physical activity in FM rehabilitation are needed.

Conflicts of interest

There are no conflicts of interest.

References

Affaitati G, Costantini R, Fabrizio A, et al. Effects of treatment of peripheral pain generators in fibromyalgia patients. Eur J Pain. 2011;15(1):61-69.

Almodovar R, Carmona L, Zarco P, Collantes E, Gonzalez C, Mulero J et al. Fibromyalgia in patients with ankylosing spondylitis: prevalence and utility of the measures of activity, function and radiological damage. Clin Exp Rheumatol. 2010;28(6Suppl 63):S33-S39.

Alonso-Blanco C, Fernandez-de-las-Penas C, Morales-Cabezas M et al. Multiple active myofascial trigger points reproduce the overall spontaneous pain pattern in women with fibromyalgia and are related to widespread mechanical hypersensitivity. Clin J Pain, 2011;27(5):405-413.

Altan L, Bingol U, Aykac M, Koc Z, Yurtkuran M. Investigation of the effects of pool-based exercise on fibromyalgia syndrome. Rheumatology International. 2004;24(5):272-277.

Azevedo VF, Paiva Edos S, Felippe LR, Moreira RA. Occurrence of fibromyalgia in patients with ankylosing spondylitis. Rev Bras Reumatol. 2010;50(6):646-650.

Bennett R. The Fibromyalgia Impact Questionnaire (FIQ): a review of its development, current version, operating characteristics and uses. Clin Exp Rheumatol. 2005;23 (Suppl. 39):S154-S162.

Bidonde J, Busch AJ, Webber SC et al. Aquatic exercise training for fibromyalgia. Cochrane Database Syst Rev 2014;(10):CD011336. doi: 10.1002/14651858.CD011336.

Busch AJ, Webber SC, Richards RS. Resistance exercise training for fibromyalgia. Cochrane Database Syst Rev 2013;(12):CD010884. doi: 10.1002/14651858.CD010884.

Busch AJ, Webber SC, Brachaniec M, Bidonde J et.al. Exercise Therapy for Fibromyalgia. Curr Pain Headache Rep. 2011;15(5):358-367.

Busch AJ, Thille P, Barber KA, et al. Best practice: E-Model–prescribing physical activity and exercise for individuals with

fibromyalgia. Physiother Theory Pract. 2008a;24(3):151-166.
Busch AJ, Schachter CL, Overend TJ, Peloso PM, Barber KA. Exercise for fibromyalgia: a systematic review. J Rheumatol. 2008b;35(6):1130-1144.
Carville SF, Arendt-Nielsen S, Bliddal H, Blotman F, Branco JC, Buskilla D, Da Silva JAP, Danneskiold-Samsøe B, Dincer F et al. EULAR evidence based recommendations for the management of fibromyalgia syndrome. Ann Rheum Dis. 2008;67(4):536-541. doi:10.1136/ard.2007.071522.
Chakrabarty S, Zoorob R. Fibromyalgia. Am Fam Physician, 2007;76(2):247-254.
Clauw D, Crofford L. Chronic widespread pain and fibromyalgia: what we know, and what we need to know. Best Pract Res Clin Rheumatol. 2003;17(4):685-701.
Cuatrecasas G, Riudavets C, Güell MA, Nadal A. Growth hormone as concomitant treatment in severe fibromyalgia associated with low IGF-1 serum levels. A pilot study. BMC Musculoskelet Disord. 2007;8:119.
Da Costa D, Abrahamowicz M, Lowensteyn I, Bernatsky S, Dritsa M, Fitzcharles MA et al. A randomized clinical trial of an individualized home-based exercise programme for women with fibromyalgia. Rheumatology. 2005;44(1):1422-1427.
Di Franco M, Iannuccelli C, Bazzichi L, Atzeni F, Consensi A, Salaffi F. Misdiagnosis in fibromyalgia: a multicentre study. Clin Exp Rheumatol., 2011;29(6Suppl 69):S104-S108.
Dick BD, Verrier MJ, Harker KT et al. Disruption of cognitive function in fibromyalgia syndrome. Pain. 2008;139(3):610-616. doi: 10.1016/j.pain.2008.06.017.
Ekici G, Bakar Y, Akbayrak T et al. Comparison of manual lymph drainage therapy and connective tissue massage in women with fibromyalgia: a randomized controlled trial. J Manipulative Physiol Ther. 2009;32(2):127-133.
Ferrari R, Russell AS. A questionnaire using the modified 2010 American College of Rheumatology criteria for fibromyalgia: specificity and sensitivity in clinical practice. J Rheumatol. 2013; 40(9):1590-1595.
Ge HY, Wang Y, Fernandez-de-Las-Penas C. Reproduction of overall spontaneous pain pattern by manual stimulation of active myofascial trigger points in fibromyalgia patients. Arthritis Res Ther. 2011;13(2):R48. doi: 10.1186/ar3289.
Gilliland RP. A medical perspective on fibromyalgia. In: Chaitow L, ed. Fibromyalgia Syndrome: a Practitioner's Guide to Treatment. New York, NY: Churchill Livingstone; 2000,111-119.
Gowans SE, Dehueck A, Silaj A et al. Six-month and one-year followup of 23 weeks of aerobic exercise for individuals with fibromyalgia. Arthritis Rheum. 2004;51(6):890-898. DOI: 10.1002/art.20828.
Jones KD, Liptan GL. Exercise interventions in fibromyalgia: clinical applications from the evidence. Rheum Dis Clin North Am. 2009;35(2):373-391.
Kingsley JD, Panton LB, Toole T, Sirithienthad P, Mathis R, McMillan V. The effects of a 12-week strength-training program on strength and functionality in women with fibromyalgia. Arch Phys Med & Rehabil. 2005;86(9):1713-1721.
McLoughlin MJ, Stegner AJ, Cook DB. The relationship between physical activity and brain responses to pain in fibromyalgia. J Pain. 2011;12(6):640-651. doi: 10.1016/j.jpain.2010.12.004.
Nijs J, Roussel N, Van Oosterwijck J, De Kooning M, Ickmans K, Struyf F et al. Fear of movement and avoidance behaviour toward physical activity in chronic-fatigue syndrome and fibromyalgia: state of the art and implications for clinical practice. Clin Rheumatol. 2013;32(8):1121-1129.
Podell N. Fibromyalgia Syndrome's New Paradigm: Neural Sensitization and Its Implications for Treatment. J Musculoskeletal Pain, 2007;15(2):45-54.
Staud R, Nagel S, Robinson ME, Price DD. Enhanced central pain processing of fibromyalgia patients is maintained by muscle afferent input: a randomized, double-blind, placebo-controlled study. Pain. 2009;145(1-2):96-104.
Suoyrjö H, Oksanen T, Hinkka K, Pentti J, Kivimäki M, Klaukka T, Vahtera J. A comparison of two multidisciplinary inpatient rehabilitation programmes for fibromyalgia: a register linkage study on work disability. J Rehabil Med. 2009;41(1):66-72.
Thomas EN, Blotman F. Aerobic exercise in fibromyalgia: a practical review. Rheumatol Int. 2010; 30(9):1143-1150.
Vierck CJ, Staud R, Price DD et. al. The Effect of Maximal Exercise on Temporal Summation of Second Pain in Patients with Fibromialgia syndrome. J Pain 2001;2(6):334-344.
Wolfe F, Brahler E, Hinz A, Hauser W. Fibromyalgia prevalence, somatic symptom reporting, and the dimensionality of polysymptomatic distress: results from a survey of the general population. Arthritis Care Res. 2013;65(5):777-785.
Wolfe F, Rasker JJ. Fibromyalgia. In: Kelley's Textbook of Rheumatology, Firestein GS, Budd RC, Gabriel S, McInnes IB, O'Dell JR, Eds. Elsevier, Philadelphia, Pa, USA, 9th edition, 2012,733-752.
Wolfe F et al. The American College of Rheumatology 1990 Criteria for the Classification of Fibromyalgia. Report of the Multicenter Criteria Committee. Arthritis Rheum;1990;33(2):160-172.
***. Spitzer Quality of Life Index. Instructions for the Investigator/Research Associate/Nurse: Available online from http://www.rtog.org/members/forms/9913/qolinstr.pdf, 2010. Accessed in June 2016.

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The effect of an antioxidant complex and exercise on induced lymphedema in rats

Efectul unui complex de antioxidanți şi al efortului fizic asupra limfedemului indus la şobolani

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Abstract

Background. The incidence and complexity of breast cancer related lymphedema determined us to study the effect of an antioxidant complex and of physical activity on lymphedema in female rats.

Aims. Redox homeostasis in animals with induced lymphedema, the effect of physical exercise and of supplementation with an antioxidant complex with phyto-homeopathic properties were studied.

Methods. The research was conducted on female Wistar rats, assigned to 5 groups (n = 10 animals/group): group I - control group; groups II-IV were operated for right axillary lymph node excision; group III was subjected to physical exercise; group IV was supplemented with an antioxidant complex; group V was subjected to physical exercise and supplemented with an antioxidant complex. Forelimb volume was measured to assess lymphedema before surgery and on days 3, 7, 14, 21 post-surgery. Redox homeostasis was determined based on the values of malonaldehyde (MDA) and thiol groups (SH) on day 21 post-surgery.

Results. At 21 days, we found a reduction in the volume of the affected limb after the regular exercise program and supplementation with the antioxidant complex.

Conclusions. Supplementation with the antioxidant complex has a positive role in improving lymphedema.

Key words: lymphedema, antioxidant complex, exercise.

Rezumat

Premize. Incidența şi complexitatea diagnosticului de limfedem, secundar intervenției chirurgicale pentru tratamentul cancerului de sân, ne-au determinat să studiem efectul unui complex de antioxidanți şi al efortului fizic asupra limfedemului la şobolani femele.

Obiective. S-a studiat: homeostazia redox la animale cu limfedem indus şi influența efortului fizic şi al suplimentării cu un complex fitohomeopat cu proprietăți antioxidante, cu efecte asupra circulației limfatice şi venoase.

Metode. Cercetările au fost efectuate pe şobolani femele, rasa Wistar, grupate în 5 loturi (n=10 animale/lot): lotul I - lotul martor; loturile II-IV au fost operate pentru extirparea ganglionară axilară dreaptă; lotul III a fost supus şi efortului fizic; lotul IV a fost suplimentat cu un complex antioxidant; lotul V a fost supus efortului fizic şi suplimentării cu un complex antioxidant. S-a măsurat volumul membrelor anterioare pentru a evalua edemul limfatic înainte de operație, în ziua 3, 7, 14 şi 21 postoperator. Homeostazia redox s-a determinat pe baza valorilor MDA şi SH la 21 zile postoperator.

Rezultate. La 21 zile s-a constatat o reducere a volumului membrului afectat de limfedem după programul regulat de exercițiu fizic şi după administrarea de complex antioxidant.

Concluzii. Administrarea complexului de antioxidanți are un rol favorabil în ameliorarea limfedemului.

Cuvinte cheie: limfedem, complex antioxidant, efort fizic.

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Introduction

Breast cancer is the most common type of cancer in females (Fong et al., 2014). The standard treatment of breast cancer is aggressive and has many side effects. The most frequent side effects are lymphedema and decreased range of motion. Upper limb lymphedema occurs in 24-49% of cases after total mastectomy and in 2.4-49% after axillary lymph node dissection (Smykla et al., 2013).

Lymphedema is a chronic and progressive condition caused by the damage of the lymphatic system and insufficient regeneration of lymphatic vessels (Mendez et al., 2012). Lymphedema manifests itself by increasing extracellular fluid, fibrosis, chronic inflammation of the tissues and an increased number of stagnant proteins at the cellular level (Hayes et al., 2008; Erickson et al., 2001; Cormie et al., 2013), disfigurement of the affected limb, physical discomfort and impaired arm function. Lymphedema also affects patients psychically, causing anxiety, depression, it affects social relationships, alters body image and decreases self-esteem (Torres et al., 2010). Lymphedema predisposes to the occurrence of erysipelas, lymphangitis and lymphangiosarcoma (Liu, 2004; Masmoudi et al., 2004; Ocana & Delgaco, 2006).

To decrease the incidence of postoperative complications, many studies recommend to start the rehabilitation program after surgery as soon as possible (Petito et al., 2012), ideally from the first postoperative day (Cinar et al., 2008; Kilgour et al., 2008; Rezende et al., 2006; Springer et al., 2010; Pinto e Silva et al., 2004).

After the wound is healed, hydrotherapy is recommended because it has no side effects; adherence to it is estimated at almost 90% and has the effect of reducing muscle tension in the neck, wrists, shoulders and legs (Cantarero-Villanueva et al., 2013).

Hypothesis

An antioxidant complex and physical exercise may have positive effects on the treatment of induced lymphedema in rats.

Material and methods

Research protocol

The research was approved by the Ethics Committee of the ”Iuliu Hatieganu” University of Medicine and Pharmacy Cluj-Napoca.

a) Period and place of the research

The experiment took place in the Experimental Research Laboratory at the Physiology Department of the ”Iuliu Hatieganu” University of Medicine and Pharmacy Cluj-Napoca, in July 2016.

b) Subjects and groups

The subjects of this study were female Wistar rats aged between 6-7 months, with a weight of 280-300 g, from the biobase of the ”Iuliu Haţieganu” University of Medicine and Pharmacy Cluj-Napoca.

The subjects were assigned to 5 groups (n = 10 animals/group):

- Group I - control group
- Groups II-IV were operated for right axillary lymph node excision
- Group III was subjected to physical exercise
- Group IV was supplemented with an antioxidant complex
- Group V was subjected to physical exercise and supplemented with an antioxidant complex.

Surgery for axillary lymph node excision in order to induce lymphedema was performed using the method of Mendez & al. (2012).

Supplementation with the antioxidant complex (AO) was carried out by administration of the Circulation Blend SP-11B product, produced by Secom. The daily AO dose was 10 mg/day/animal, by oropharyngeal gavage.

c) Tests applied

- For aerobic exercise capacity, the method of Nayanatara et al. (2005) was used, consisting of swimming for 15 minutes, every day, in the swimming pool of the Physiology Department Laboratory of the University of Medicine and Pharmacy Cluj-Napoca.
- Lymphedema was assessed based on the volume of the forelegs, determined using a Ugo Basile 7140 Plethysmometer device before surgery and on days 3, 7, 14 and 21 post-surgery. Values are expressed as % of controls.
- The O/AO balance was assessed by measurement of malonaldehyde (MDA) – using the fluorescence method (Conti et al., 1991) and the carbonyl assay (CA) – according to the method of Hu (1994), from venous blood from the retrobulbar vein, on the 21st postoperative day. Values were expressed in μmol/ml for MDA and nmol/ml for CA. Determinations were performed in the Laboratory for the Study of Oxidative Stress of the Physiology Discipline at UMPh Cluj-Napoca.

d) Statistical analysis

- Statistical analysis was performed using the MedCalc 16.8 program. We conducted a comparative and correlation analysis.

Results

a) Comparative analysis of the studied indicators

Comparative analysis of MDA by groups (Table I)

The statistical analysis of MDA values, considering all control groups, revealed highly statistically significant differences between at least two groups ($p < 0.01$).

The statistical analysis of MDA values, considering all groups with surgical excision of axillary lymph nodes, revealed highly statistically significant differences between at least two groups ($p < 0.01$).

The statistical analysis of MDA values, considering all exercise groups, revealed no statistically significant differences between groups ($p > 0.05$).

The statistical analysis of MDA values, considering all groups with antioxidant supplementation, revealed no statistically significant differences between groups ($p > 0.05$).

The statistical analysis of MDA values for unpaired samples revealed:

- Highly statistically significant differences between groups I-IV I-V, II-IV ($p < 0.01$);
- Statistically significant differences between groups I-II, I-III ($p < 0.05$).

Comparative analysis of CA by groups (Table II)

The statistical analysis of CA values, considering all control groups, revealed highly statistically significant

Table I

Comparative analysis of malonaldehyde (expressed in nmol/ml) in the studied groups and statistical significance.

Group	Mean	SE	SD	Median	Min.	Max.	25 - 75 P
I	2.16	0.291	0.11	2.115	1.674	2.569	2.049 to 2.380
II	1.764	0.4254	0.1608	1.505	1.429	2.544	1.446 to 1.994
III	1.477	0.582	0.22	1.362	0.856	2.606	1.099 to 1.711
IV	1.262	0.2222	0.08399	1.346	0.828	1.502	1.174 to 1.389
V	1.342	0.3785	0.1431	1.423	0.843	1.794	0.960 to 1.644
p	I-II:0.0350	I-III:0.0350	I-IV:0.0017	I-V:0.0027	II-III:0.2248	II-IV:0.0060	II-V:0.1102
	III-IV:0.6547	III-V:0.9491	IV-V:0.4062				

Table II

Comparative analysis of the carbonyl assay (expressed in μmol/ml) in the studied groups and statistical significance.

Group	Mean	SE	SD	Median	Min.	Max.	25 - 75 P
I	0.261	0.01839	0.006951	0.263	0.237	0.284	0.243 to 0.275
II	0.24	0.08061	0.03047	0.226	0.157	0.373	0.171 to 0.293
III	0.18	0.05968	0.02256	0.18	0.0604	0.238	0.170 to 0.227
IV	0.213	0.07064	0.0267	0.242	0.123	0.304	0.139 to 0.259
V	0.227	0.07405	0.02799	0.198	0.17	0.388	0.192 to 0.229
p	I-II:0.6547	I-III:0.0027	I-IV:0.1797	I-V:0.0253	II-III:0.3379	II-IV:0.6547	II-V:0.9491
	III-IV:0.2502	III-V:0.3379	IV-V:0.9491				

differences between at least two groups ($p < 0.01$).

The statistical analysis of CA values, considering all groups with surgical excision of axillary lymph nodes, revealed highly statistically significant differences between at least two groups ($p < 0.01$).

The statistical analysis of CA values, considering all exercise groups, revealed no statistically significant differences between groups ($p > 0.05$).

The statistical analysis of CA values, considering all groups with antioxidant supplementation, revealed no statistically significant differences between groups ($p > 0.05$).

The statistical analysis of CA values for unpaired samples revealed:

- Highly statistically significant differences between groups I-III ($p < 0.01$);
- Statistically significant differences between groups I-V ($p < 0.05$).

Comparative analysis of lymphedema by groups (Table III)

The statistical analysis of the volumes of the right foreleg with lymphedema, considering all control groups, revealed highly statistically significant differences between all groups, at all time points ($p < 0.01$).

The statistical analysis of the right foreleg volumes, considering all control groups and the groups with surgical excision of axillary lymph nodes, revealed highly statistically significant differences between all groups, at all time points ($p < 0.01$).

The statistical analysis of the right foreleg volumes, considering all groups with surgical excision of axillary lymph nodes, revealed highly statistically significant differences between groups II-III on days 14 and 21; groups III-IV on days 7, 14 and 21; groups III-V on day 14; and groups IV-V on day 21 ($p < 0.01$).

The statistical analysis of the right foreleg volumes, considering all groups with surgical excision of axillary lymph nodes, revealed statistically significant differences between groups II-III on day 7; groups II-IV on day 21; groups II-V on day 14; and groups IV-V on day 14 ($p < 0.05$).

The comparative analysis of lymphedema in all groups at different time points revealed that on postoperative day 3, all animals had an increased right foreleg volume. Group II had an improvement in lymphedema starting with day 7, continuing with days 14 and 21. In groups III and V, a very significant improvement was observed on days 14 and 21 compared to day 3.

Comparative analysis of lymphedema by evaluation moments (Table III)

The statistical analysis of the right foreleg volumes, considering the control group (I) at the studied moments, showed no statistically significant differences ($p > 0.05$).

The statistical analysis of the right foreleg volumes, considering group II at the studied moments, showed highly statistically significant differences between days: 0-3, 0-7, 3-14, 3-21, 7-14, 7-21, 14-21 ($p < 0.01$).

The statistical analysis of the right foreleg volumes, considering group II at the studied moments, showed statistically significant differences between days: 0-14, 3-7 ($p < 0.05$).

The statistical analysis of the right foreleg volumes, considering group III at the studied moments, showed highly statistically significant differences between days: 3-14, 3-21, 7-14, 7-21, 14-21 ($p < 0.01$). The statistical analysis of the right foreleg volumes, considering group III at the studied moments, showed statistically significant differences between days: 0-3, 0-7, 0-14 ($p < 0.05$).

The statistical analysis of the right foreleg volumes, considering group IV at the studied moments, showed highly statistically significant differences between days: 0-14, 0-21, 3-14, 3-21, 7-14, 7-21, 14-21 ($p < 0.01$).

The statistical analysis of the right foreleg volumes, considering group IV at the studied moments, showed statistically significant differences between days: 3-7 ($p < 0.05$).

The statistical analysis of the right foreleg volumes, considering group V at the studied moments, showed

Table III

Comparative analysis of the foreleg volumes (expressed as % of controls) in the studied groups and statistical significance

Group	Moment	Mean	SE	SD	Median	Min.	Max.	25 - 75 P	p	
I	Day 0	100	0	0	100	100	100	100.000 – 100.000	D0-D3:1.0000	D3-D14:1.0000
	Day 3	100	0	0	100	100	100	100.000 – 100.000	D0-D7:1.0000	D3-D21:1.0000
	Day 7	100	0	0	100	100	100	100.000 – 100.000	D0-D14:1.0000	D7-D14:1.0000
	Day 14	100	0	0	100	100	100	100.000 – 100.000	D0-D21:1.0000	D7-D21:1.0000
	Day 21	100	0	0	100	100	100	100.000 – 100.000	D3-D7:1.0000	D14-D21:1.0000
II	Day 0	101.082	7.3809	2.3341	102.381	88.462	111.905	94.118 – 106.522	D0-D3:0.0057	D3-D14:0.0017
	Day 3	250.23	27.9477	8.8378	243.878	205.769	290.476	231.373 – 271.429	D0-D7:0.0011	D3-D21:0.0017
	Day 7	227.04	32.4631	10.2657	228.084	177.551	278.571	194.231 – 251.163	D0-D14:0.0108	D7-D14:0.0060
	Day 14	180.498	26.9371	8.5183	175.799	144.231	216.667	157.143 – 211.628	D0-D21:0.0708	D7-D21:0.0017
	Day 21	148.897	24.8855	7.8695	142.641	117.391	186.047	129.412 – 171.429	D3-D7:0.0476	D14-D21:0.0073
III	Day 0	101.744	13.5355	4.2803	103.204	82.692	119.048	85.714 – 114.286	D0-D3:0.0208	D3-D14:0.0073
	Day 3	270.19	35.6502	11.2736	269.218	225	330.233	240.816 – 300.000	D0-D7:0.0298	D3-D21:0.0017
	Day 7	271.098	34.3526	10.8633	268.367	226.923	323.256	245.098 – 297.619	D0-D14:0.0169	D7-D14:0.0060
	Day 14	235.73	30.1531	9.5353	244.728	190.385	278.571	209.615 – 258.140	D0-D21:0.0700	D7-D21:0.0017
	Day 21	184.241	28.5403	9.0252	186.735	134.615	223.81	167.308 – 200.000	D3-D7:0.8983	D14-D21:0.0017
IV	Day 0	108.926	10.8449	3.4295	106.322	96.154	126.19	100.000 – 118.605	D0-D3:0.0893	D3-D14:0.0017
	Day 3	262.206	17.186	5.4347	262.601	236.735	281.395	251.923 – 278.571	D0-D7:0.2656	D3-D21:0.0017
	Day 7	228.337	23.6483	7.4782	220.36	202.041	276.744	215.686 – 236.735	D0-D14:0.0044	D7-D14:0.0017
	Day 14	163.951	19.5799	6.1917	163.37	134.615	192.857	148.980 – 181.395	D0-D21:0.0019	D7-D21:0.0017
	Day 21	125.796	11.3972	3.6041	124.158	109.615	145.238	118.367 – 135.714	D3-D7:0.0181	D14-D21:0.0017
V	Day 0	111.447	10.1938	3.2236	109.583	98.077	126.19	104.082 – 118.605	D0-D3:0.0051	D3-D14:0.0017
	Day 3	259.875	25.3531	8.0173	257.934	228.846	311.905	244.231 – 271.429	D0-D7:0.0062	D3-D21:0.0017
	Day 7	250.03	29.4244	9.3048	247.877	211.538	307.143	226.531 – 262.745	D0-D14:0.0001	D7-D14:0.0017
	Day 14	196.45	26.5621	8.3997	187.223	167.308	235.714	173.077 – 220.930	D0-D21:0.0085	D7-D21:0.0017
	Dat 21	165.318	16.4758	5.2101	167.252	139.216	183.721	146.154 – 178.571	D3-D7:0.2774	D14-D21:0.0017
p	D0(I-II):0.0001		D3(I-II): 0.0001		D7(I-II):0.0001			D14(I-II): 0.0001		D21(I-II): 0.0001
	D0(I-III):0.0001		D3(I-III):0.0001		D7(I-III):0.0001			D14(I-III): 0.0001		D21(I-III): 0.0001
	D0(I-IV):0.0001		D3(I-IV):0.0001		D7(I-IV): 0.0001			D14(I-IV): 0.0001		D21(I-IV): 0.0001
	D0(I-V):0.0001		D3(I-V):0.0001		D7(I-V): 0.0001			D14(I-V): 0.0001		D21(I-V): 0.0001
	D0(II-III): 0.7913		D3(II-III):0.1988		D7(II-III): 0.0191			D14(II-III):0.0015		D21(II-III):0.0089
	D0(II-IV):0.1508		D3(II-IV):0.2899		D7(II-IV): 0.9698			D14(II-IV):0.1903		D21(II-IV):0.0355
	D0(II-V):0.0539		D3(II-V):0.5453		D7(II-V):0.1620			D14(II-V):0.0265		D21(II-V):0.1212
	D0(III-IV): 0.3445		D3(III-IV):0.5453		D7(III-IV):0.0041			D14(III-IV):0.0001		D21(III-IV):0.0001
	D0(III-V):0.1620		D3(III-V):0.5708		D7(III-V): 0.1509			D14(III-V):0.0089		D21(III-V):0.0696
	D0(IV-V): 0.6229		D3(IV-V):0.5708		D7(IV-V): 0.0539			D14(IV-V):0.0185		D21(IV-V):0.0002

Table IV

Correlation analysis of the studied indicators.

Items		Group I		Group II		Group III		Group IV		Group V	
MDA	CA	-0.071	*	0.75	****	0.143	*	0.25	*	0.714	****
	Lymphedema	-	-	0.607	***	-0.464	***	0	*	0.071	*
CA	Lymphedema	-	-	0.356	**	0.607	***	0.055	*	-0.357	**

highly statistically significant differences between days: 3-7, 14-21 ($p < 0.01$).

The statistical analysis of the right foreleg volumes, considering group V at the studied moments, showed statistically significant differences between days: 0-3, 0-7, 0-14, 0-21, 3-14, 3-21, 7-14, 7-21, 14-21 ($p < 0.05$).

b) Correlation analysis of the studied indicators (Table IV)

The correlation analysis of the studied indicators showed:

- for group II: a very good positive correlation between MDA-CA; a good positive correlation between MDA-lymphedema; an acceptable positive correlation between CA-lymphedema;
- for group III: a good positive correlation between MDA-lymphedema;
- for group IV: an acceptable positive correlation between MDA-lymphedema and CA-lymphedema;
- for group V: a very good positive correlation between MDA-CA; an acceptable positive correlation between CA-lymphedema.

Discussions

Circulation Blend SP-11B is a plant extract-based product with homeopathic nutrients which improves the blood and lymphatic flow (Secom). The complex contains a patented blend with natural homeopathic components including: pepper (Capsicum annuum - seeds), thorn (Ruscus aculeatus - root), kelp (Laminaria spp. – whole plant), Gentiana (Gentiana lutea - root), ginger (Zingiber officinale - root), verbina (Verbena officinalis – the aerial part) (Secom).

A number of studies have shown the antioxidant (AO) action of the bioactive compounds of the product:

- Chili seeds contain two fractions of phenolic flavonoids (quercetin and catechin) and capsaicinoids in pericarp (Materská & Perucka, 2005), whose AO activity increases with maturity; the mature seeds contain high quantities of antioxidant vitamins C and A (Ghazemnezhad et al., 2011; Marin et al., 2004);
- Thorn root contains phenolic compounds and ellagic phenolic acids and quercetin (Luis et al., 2011);

- Kelp, called "the gift of the sea", is a seaweed that contains three sulfate polysaccharide fractions (F1, F2, F3) with a powerful AO effect (Amin & Siew Hong, 2002; Wanga et al., 2008);

- Ginger root contains phenolic compounds such as α-zingiberene, gingerol and shogaol, with an AO effect (Stoilova et al., 2006; Zancana et al., 2002) stronger than that of quercetin (Stoilova et al., 2006);

- Verbena (aerial part), due to its total phenolic and flavonoid content, has AO effects (Rehechoa et al., 2011; Casanova et al., 2008).

Quercetin, present in most components of the AO blend, is a powerful protector for the cardiovascular system and reduces oxidative stress (***, 2015). Also, quercetin has the ability to modulate the signal transduction pathways associated with inflammatory and carcinogenic processes. Animal studies have demonstrated that administration of this flavonoid prevents chemically induced carcinogenesis, and epidemiological studies indicate a protective effect on lung cancer. For these reasons, quercetin is considered a positive agent in cancer prevention (Murakami et al., 2008).

Highly statistically significant differences were observed between groups I-II, I-III I-IV I-IV, which shows that after surgery for removal of axillary lymph nodes, the right forelimb volume increased significantly.

Highly statistically significant differences were also observed between groups II-III on days 14 and 21; groups III-IV on days 7, 14 and 21; groups III-V on day 14; groups IV-V on day 21, and statistically significant differences between groups II-III on day 7; groups II-IV on day 21; groups II-V on day 14; groups IV-V on day 14, which demonstrates the beneficial effect of the AO complex on lymphatic and circulatory system function through the development of remaining lymphatic vessels favoring extracellular fluid resorption and reduction of lymphedema.

The same positive effect is demonstrated by other experimental studies which used AOs; either a moderate effect (Ewertz & Jensen, 2011), or a significant improvement (Chang et al., 2013) on lymphedema and blood circulation (Kasseroller & Schrauzer, 2000) was obtained. Even fibrosis in the context of lymphedema was significantly reduced by AO intake (Delanian & Lefaix, 2004).

Active physical exercise stimulates skeletal muscle contraction, which acts as a major pumping mechanism of lymph and venous blood (Bicego et al., 2006), playing a key role in the development of the collateral lymphatic network (Lane et al., 2005), acting in favor of lymph angiogenesis (de Oliveira et al., 2014). Physical exercise associated with an AO complex decreases the positive AO effect on lymphedema. Moderate physical effort has AO effects, while intensive exercise has a pro-oxidant effect (Bulduş, 2012).

Our results show that the experimental model used for the induction of lymphedema is a valid model (Mendez et al., 2012).

Redox homeostasis in animals with or without exercise, with or without AO supplementation, is established under lymphedema conditions with the reduction of oxidative stress on account of MDA (G II-G V).

Moderate physical exercise has an AO effect in animals with lymphedema; this is also evidenced by other authors (Bulduş, 2012), in the absence of lymphedema.

Associating AO supplementation with physical exercise in animals with lymphedema (G V) determines at 21 days a decrease of oxidative stress and an AO effect simultaneously with the reduction of lymphedema, the effects being superior to those in animals with lymphedema, subjected to physical exercise (G III).

Conclusions

1. The AO complex determines at 21 days a decrease of oxidative stress in animals with lymphedema with or without physical exercise, compared to control values.

2. AO supplementation reduces lymphedema in animals with or without physical exercise at 21 days compared to day 3.

3. AO supplementation has significant favorable effects on lymphedema at 21 days, compared to the association of AO and physical exercise therapy.

4. Associated AO and physical exercise therapy has a significant favorable effect compared to physical exercise therapy in lymphedema at 21 days, and it could be recommended after radical mastectomy with lymph node dissection.

Conflicts of interests

There are no conflicts of interests.

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References

Amin I, Siew Hong T. Antioxidant activity of selected commercial seaweeds. Mal J Nutr 2002;8(2):167-177.

Bicego D, Brown K, Ruddick M, Storey D, Wong C, Harris SR. Exercise for women with or at risk for breast cancer–related lymphedema. Phys Ther 2006; 86(10):1398-1405.

Bulduş CF. Paradoxul balanţei oxidanţi/antioxidanţi în efortul fizic. Teză de doctorat. UMF „Iuliu Haţieganu" Cluj-Napoca, 2012,20-21.

Cantarero-Villanueva I, Fernández-Lao C, Caro-Morán E, Morillas-Ruiz J, Galiano-Castillo N, Díaz-Rodríguez L, Arroyo-Morales M. Aquatic exercise in a chest-high pool for hormone therapy-induced arthralgia in breast cancer survivors: a pragmatic controlled trial. Clin Rehabil 2013; 27(2):123-132. doi: 10.1177/0269215512448256.

Casanova E, García-Mina JM, Calvo MI. Antioxidant and antifungal activity of verbena officinalis L. leaves. Plant Foods Hum Nutr 2008;63(3):93-97. doi:10.1007/s11130-008-0073-0.

Chang TC, Uen YH, Chou CH, Sheu JR, Chou DS. The role of cyclooxygenase-derived oxidative stress in surgically induced lymphedema in a mouse tail model. Pharma Biol 2013;51(5):573-580. doi: 10.3109/13880209.2012.749923.

Cinar N, Seckin Ü, Keskin D, Bodur H, Bozkurt B, Cengiz O. The effectiveness of early rehabilitation in patients with modified radical mastectomy. Cancer Nurs 2008;31(2):160-165.

Conti M, Morand PC, Levillain P, Lemonnier A. Improved fluorometric determination of malonaldehyde. Clin Chem 1991;37(7):1273-1275.

Cormie P, Galvão DA, Spry N, Newton RU. Neither heavy nor light load resistance exercise acutely exacerbates lymphedema in breast cancer survivors. Integr Cancer Ther 2013;12(5):423-432. doi: 10.1177/1534735413477194.

de Oliveira MF, de Rezende LF, do Amaral MP, Pinto e Silva M P, Morais SS, Costa Gurgel MS.. Manual lymphatic drainage versus exercise in the early postoperative period for breast cancer. Physiotherapy Theory & Practice. 2014;30(6):384-389. doi:10.3109/09593985.2013.876695.

Delanian S, Lefaix JL. The radiation-induced fibroatrophic process: therapeutic perspective via the antioxidant pathway. Radiother Oncol 2004;73(2):119-131.

Erickson VS, Pearson ML, Ganz PA, Adams J, Kahn KL. Arm edema in breast cancer patients. J Natl Cancer Inst 2001; 93(2):96-111.

Ewertz M, Jensen AB. Late effects of breast cancer treatment and potentials for rehabilitation. Acta Oncol 2011;50(2):187-193. doi: 10.3109/0284186X.2010.533190.

Fong SS, Ng SS, Luk WS, Chung JW, Ho JS, Ying M, Ma AW. Effects of Qigong Exercise on Upper Limb Lymphedema and Blood Flow in Survivors of Breast Cancer. Integr Cancer Ther 2014;13(1):54-61. doi: 10.1177/1534735413490797.

Ghasemnezhad M, Sherafati M, Payvast GA. Variation in phenolic compounds, ascorbic acid and antioxidant activity of five coloured bell pepper (Capsicum annum) fruits at two different harvest times. J Funcion Foods 2011;3(1):44-49. doi:10.1016/j.jff.2011.02.002.

Hayes SC, Janda M, Cornish B, Battistutta D, Newman B. Lymphedema after breast cancer: incidence, risk factors, and effect on upper body function. J Clin Oncol. 2008; 26(21):3536-3542.

Hu ML. Measurement of protein thiol groups and glutathion in plasma. Methods Enzymol 1994; 233:380-385.

Kasseroller RG, Schrauzer GN. Treatment of secondary lymphedema of the arm with physical decongestive therapy and sodium selenite: a review. Am J Ther 2000;7(4):273-279.

Kilgour RD, Jones DH, Keyserlingk JR. Effectiveness of a self-administered, home-based exercise rehabilitation program for a women following modified radical mastectomy and axillary node dissection: a preliminary study. Breast Cancer Res Treat 2008;109(2):285-295.

Lane K, Worsley D, McKenzie D. Exercice and the lymphatic system – Implications for breast-cancer survivors. Sports Med 2005; 35(6):461-471.

Liu N. Trafficking of hyaluronan in the interstitium and its possible implications. Lymphol 2004; 37(1):6-14.

Luis A, Domingues F, Duarte AP. Bioactive compounds, RP-HPLC analysis of phenolics, and antioxidant activity of some Portuguese shrub species extracts. Nat Prod Communic 2011; 6(12):1863-1872.

Marín A, Ferreres F, Tomás-Barberán FA, Gil MI. Characterization and Quantitation of Antioxidant Constituents of Sweet Pepper (Capsicum annuum L.) Spain J Agric Food Chem 2004; 52(12):3861-3869. doi: 10.1021/jf0497915.

Masmoudi A, Maaloul I, Turki H, Elloumi Y, Marrekchi S, Bouassida S, Ben Jemaa M, Zahaf A. Erysipelas after breast cancer treatment (26 cases). Dermatol Online J. 2005;11(3):12.

Materska M, Perucka I. Capsicum annuum antioxidant activity of the main phenolic compounds isolated from hot pepper fruit (Capsicum annuum) J Agric Food Chem 2005;53(5):1750-1756. doi:10.1021/jf035331k.

Mendez U, Stroup EM, Lynch LL, Waller AB, Goldman J. A chronic and latent lymphatic insufficiency follows recovery from acute lymphedema in the rat foreleg. Am J Physiol. 2012; 303(9):H1107-H1113. doi: 10.1152/ajpheart.00522.2012.

Murakami A, Ashidab A, Terao J. Multitargeted cancer prevention by quercetin. Canc Lett 2008; 269(2):315-325. doi: 10.1016/j.canlet.2008.03.046.

Nayanatara AK, Nagaraja HS, Anupama BK. The effect of repeated sweeming stress on organ weights and lipid peroxidation in rats. J Phys Biomed Sci 2005;18(1):3-9.

Ocaña A, Delgado C, Rodríguez CA, Bellido L, Izquierdo N, Martín R, Cruz JJ. Case 3. Upper limb lymphangiosarcoma following breast cancer therapy. J Clin Oncol 2006; 24(9):1477-1478. doi: 10.1200/JCO.2005.01.8473.

Petito ELN, Pinto AC, Martinelli SE, Gil F, De Gutiérrez MGR. Application of a domicile-based exercise program for shoulder rehabilitation after breast cancer surgery. Rev LatAm Enfermag 2012;20(1):35-43. doi:10.1590/S0104-11692012000100006.

Pinto e Silva MP, Derchain SFM, Rezende L, Cabello C, Martinez EZ. Movimento do ombro após cirurgia por carcinoma invasor da mama: estudo randomizado prospectivo controlado de exercícios livres versus limitados a 90º no pós-operatório. RBGO 2004;26(2):125-130.

Rehechoa S, Hidalgoa O, García-Iñiguez de Ciranob M, Navarroc I, Astiasaránb I, Ansorenab D, Caverod RY, Calvo MI, Chemical composition, mineral content and antioxidant activity of Verbena officinalis L. LWT - Food Sci Technol 2011;44(4):875-882. doi:10.1016/j.lwt.2010.11.035.

Rezende LF, Franco RL, Rezende MF, Beletti PO, Morais SS, Gurgel MS. Two exercises schemes in postoperative breast cancer: comparison of effects on shoulder movement and lymphatic disturbance. Tumori 2006;92(1):55-61.

Smykla A, Walewicz K, Trybulski R, Halski T, Kucharzewski M, Kucio C, Mikusek W, Klakla K, Taradaj J. Effect of Kinesiology Taping on breast cancer-related lymphedema: a randomized single-blind controlled pilot study. Biomed Res Int. 2013,ID 767106.767106. doi: 10.1155/2013/767106.

Springer BA, Levy E, McGarvey C, Pfalzer LA, Stout NL, Gerbeer LH, et al. Pre-operative assessment enables early diagnosis and recovery of shoulder function in patients with breast cancer. Breast Cancer Res Treat 2010;120(1):135-147. doi: 10.1007/s10549-009-0710-9.

Stoilova I, Krastanov A, Stoyanova A b, Denev P, Gargova S. Antioxidant activity of a ginger extract (Zingiber officinale). Food Chem 2007; 102(3):764-770. doi:10.1016/j.foodchem.2006.06.023.

Torres LM, Yuste Sánchez MJ, Zapico GA, Prieto MD, Mayoral del Moral O, Cerezo Téllez E et al. Effectiveness of early physiotherapy to prevent lymphoedema after surgery for breast cancer: randomised, single blinded, clinical trial BMJ 2010;340:b5396. doi: 10.1136/bmj.b5396.

Wanga J, Zhanga Q, Zhanga Z, Lia Z. Antioxidant activity of sulfated polysaccharide fractions extracted from Laminaria japonica. Int J Biol Macromol 2008; 42(2):127-132, doi:10.1016/j.ijbiomac.2007.10.003.

Zancana KC, Marquesb MOM, Petenatec AJ, Angela M, Meireles A. Extraction of ginger (Zingiberofficinale Roscoe) oleoresin with CO2 and co-solvents: a study of the antioxidant action of the extracts. J Supercritical Fluids 2002; 24(1):57-76.

***. Secom Catalog produse 2015, 76.

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Can age influence the energy demands of the elite athlete during high intensity exercise?

Poate vârsta să influenţeze cererea energetică a sportivului elită în timpul efortului de mare intensitate?

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Abstract

Background. The nutritional recovery of elite athletes is influenced through the work performed, food intake and active recovery.

Aims. Identifying differences regarding the energy resource used during maximal effort according to age in a group of female rowers.

Methods. A transverse observational study was conducted between January and March 2016, on two groups consisting of 25 elite female rowers, included in the study according to age and competition level. The study took into account the menstrual cycle of the female athletes between January-March 2016, before the VO_{2max} test. The VO_{2max} test was performed using Cosmed Quark CPET equipment and a Concept 2 ergometer, over a distance of 2,000 m, under standard conditions, indoor.

Results. Statistically significant differences were found regarding the distribution of energy through ATP+CP (p=0.0085, 95%CI=-5.225 to -0.8523) and the use of energy substrate represented by muscle glycogen (p=0.0135, 95%CI=-85.65 to -10.98). Thus, the total 2,000 meters race completion time in G1 was 409.8±17.19 s (23.08±3.30 years), with a ratio of muscle glycogen activation, based on the RER value, of 303.7±53.93 s. In the G2 group (19.25±1.35 years), the total activity time reached was 432.3±6.81 s. with a muscular glycogen energy distribution of 352.0±32.80 s.

Conclusions. Increased time spent in maximum effort will increase the proportion of carbohydrates used during activity. However, the final ratio and the link between age and the respiratory exchange ratio, whose value reaches the upper limit, along with O_{2exp} and carbohydrate or lipid determinations, suggest an increased carbohydrate consumption during maximal effort, related to a low age, and a high monitored respiratory exchange ratio ≥1.1.

Key words: age, rower, macronutrients, RER, glycogen.

Rezumat

Premize. Recuperarea energetică a sportivului elită va fi influențată de activitatea prestată, ingestia alimentară și recuperarea activă programată.

Obiective. Identificarea diferențelor privind resursa energetică utilizată pe parcursul efortului și implicațiile asupra activității susținute în funcție de vârsta sportivului.

Metode. A fost desfășurat un studiu transversal observațional, în perioada ianuarie-martie 2016, pe două grupuri elită din canotaj (25 de sportive), incluse în studiu în funcție de vârstă și nivelul competițional. Studiul a prevăzut monitorizarea ciclului menstrual în perioada premergătoare testărilor VO_{2max} (ianuarie - februarie) susținute prin utilizarea aparaturii Cosmed Quark CPET și a ergometrului Concept 2, pe parcursul unei distanțe standard de 2,000 m, în condiții standard, indoor.

Rezultate. Au fost identificate diferențe semnificativ statistice privind distribuția energetică prin ATP+CP (p=0,0085, CI95%=-5,225 la -0,8523) și utilizarea substratului energetic reprezentat prin glicogen muscular (p=0,0135, CI95%=-85,65 la -10,98). Astfel, timpul total de finalizare a cursei de 2,000 de metri, în cadrul celor două grupuri a fost de 409,8±17,19 s în cadrul G1 (23,08±3,30 ani), cu un raport de activare al glicogenului muscular, pe baza RER, de 303,7±53,93 s. În cadrul grupului G2 (19,25±1,35 ani), timpul total de activitate a atins 432,3±6,81 s, cu o distribuție energetică a glicogenului muscular de 352,0±32,80 s.

Concluzii. Creșterea timpului petrecut în efort maximal va mări proporția de carbohidrați utilizați pe parcursul acestuia. Însă, raportul final și legătura dintre vârstă și rata de schimb respirator, a cărei valoare atinge limita superioară, alături de nivelul O_{2exp} și determinările de carbohidrați, respectiv lipide, sugerează o creștere a aportului de carbohidrați în angrenajul unui efort maximal la vârstă redusă, fiind atinsă o rată de schimb respirator ≥1,1.

Cuvinte cheie: vârstă, canotori, macronutrienți, RER, glicogen.

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Introduction

Basic dietary elements are essential in ensuring body development, the athlete's energy requirements, health status, and exercise efficiency during a specific period of time (Hoch et al., 2008). Many studies have researched the factors which influence physiological parameters during endurance effort in older age groups (Reaburn & Dascombe, 2008; Tanaka & Seals, 2003), reporting elements that influence the glycolytic energy pathway during specific anaerobic effort. Thus, it is often mentioned that maximal effort is characterized by the athlete's capacity to sustain such effort between 10 and 100 seconds. From a biochemical perspective, it will be associated with adenosine triphosphate (ATP) resynthesis through creatine kinase (CK), with glycogenolysis and glycolysis, based on the biochemical lactate system (Reaburn & Dascombe, 2009). Thus, the body's ability to adapt and perform in such effort is also influenced by several factors. Among them, the following factors are often mentioned in the literature: gender, muscle mass, type of muscle fiber, size of muscle fibers, muscle mass and strength, energy substrate availability, metabolic pathway efficiency, accumulation of reaction products, and contribution of energy systems, heredity, including effort parameters, namely the level of training (Reaburn & Dascombe, 2009).

From a practical standpoint, the differences between male and female groups are defined in the specialty practice. Thus, male groups seem to impose a higher rate of performance during activities with oxygen debt or during anaerobic exercise tests (Weber & Schneider, 2002). These differences were often set to 25% between male and female athletes during controlled activities (McCartney et al., 1986). From this point of view, the energy substrate used by female activity groups must be studied separately (Isacco et al., 2012). Stressors, both physical and psychical, through the complexity of effort carried out by female athletes can be related to hormonal imbalances, involving menstrual imbalance (Marcus et al., 2001; Martin & Tomescu, 2016a). From this point of view, current works suggest the influence of the energy system over a distinct period of training, taking into account that the increased value of estrogen in the luteal phase decreases the utilization of carbohydrates during exercise, stimulating the validity and usability of fatty acids and improving athletic ability during endurance exercise (Uranga et al., 2005).

Hypothesis

Age differences established between elite athletes tend to alter the perception of the effort performed at different stages of the competition season. This aspect was determined based on the athlete's recovery capacity, a reduction in the total recovery time being shown for young athletes. However, the study conducted claims that in the case of the youth group, unlike the senior group, the anaerobic activation system is different, with a possible increase in the respiratory exchange ratio, accessing more quickly, and in a greater proportion, carbohydrates during exercise. In a long-term action, following sustained activity in an upper cardiac zone, metabolic imbalances can be reported, limiting the programmed activity.

Material and method

Research protocol

A transverse observational study was conducted after obtaining the approval from the Ethics Committee of the university and the verbal consent of the informed subjects to participate in the study. In this paper, we monitored the athlete's perception and performance based on the age of the individual during a maximal effort carried out over a standard distance of 2,000 meters, during a rowing race simulation, performed indoor.

a) Period and place of the research

The study was conducted between January and March 2016, in Bucharest, Romania, in two different training centers where the athletes performed their weekly activity.

b) Subjects and groups

A total of 25 female rowers were included in the study. Their distribution in study groups was made according to their age. Thus, G1 corresponded to a group of elite female rowers with a mean age of 23.08±3.30 years, 182.7±3.98 cm height and 74.48±5.85 kg body weight. G2 corresponded to a group of elite female rowers with a mean age of 19.25±1.35 years, 180.3±3.82 cm height and 71.33±3.79 kg body weight.

c) Test applied

Two VO_{2max} tests were carried out by the two groups of subjects involved in the study (one test for each group). Previously, the menstrual cycle of the female athletes was monitored in direct association with the VO_{2max} test. As a result, the February – January period revealed the menstrual phase for both study groups. Measurements were performed using Cosmed Quark CPET equipment, and a Concept 2 ergometer, by conducting a VO_{2max} test over a standard rowing distance of 2,000 without imposing a time limit for completion, or an effort developed in different intensity stages. The VO_{2max} test was performed after preparatory work conducted in order to adapt the body to exercise. This phase was conducted over 25 minutes, involving both basic elements in preparing the body for a VO_{2max} test, and ergometer specific activity at a predetermined intensity (65-85% HR) in order to technically simulate the effort which would have been performed. Auxiliary parameters such as heart rate were transmitted via a Cosmed heart rate band through Bluetooth, to the main device.

During the measurements, the following parameters were monitored: heart rate (HR - bpm), respiratory exchange ratio (RER), respiratory frequency (Rf), minute ventilation (VE - l/min), maximum rate of oxygen consumption (VO_2 - ml/ min), metabolic equivalent (METS), tidal ventilation (VT - l), the amount of oxygen expired (O_{2exp} - ml), amount of carbon dioxide expired (CO_{2exp} - ml), end-tidal oxygen tension ($PetO_2$ - mmHg), end-tidal carbon dioxide tension ($PetCO_2$ - mmHg), energy expenditure (Kcal/min), lipid consumption (fat - g%) and carbohydrate consumption (CHO - g/%). The respiratory exchange ratio (RER) was used in order to divide the energy systems (ATP, ATP+CP, muscle glycogen).

d) Statistical processing

Statistical evaluation was performed using the GraphPad Prism 7.0 software. The statistical indicators used were: average value (mean), standard deviation (SD),

Table I
Classification of menstrual cycle phases during the testing period for group G1.

General data	Menstrual cycle (29.46±2.72 days)		Ovulation (14.08±1.32 days)		Menstruation (5.53±1.12 days)	
Menstrual phase	Follicular	Ovulatory	Luteal	Menstrual	Amenorrhea	Total number
Number of athletes	4	0	3	6	0	13

Table II
Classification of menstrual cycle phases during the testing period for group G2

General data	Menstrual cycle (28.42±10.27 days)		Ovulation (13.92±5.03 days)		Menstruation (4.58±1.97 days)	
Menstrual phase	Follicular	Ovulatory	Luteal	Menstrual	Amenorrhea	Total number
Number of athletes	3	0	6	2	1	12

and coefficient of variation (CV). Data were expressed as mean value and standard deviation (mean±SD). For data normalization, the Shapiro-Wilk test (w) was used. In order to demonstrate the association's type hypothesis, we applied Pearson's correlation (r), and in order to determine the differences between the study groups, we applied the Student t-test (unpaired). The level of significance $p<0.05$ was considered statistically significant.

Results

Group G1 consisted of 13 elite female rowers with a reported average age of 23.08±3.30 years, 182.7±3.98 cm height, and 74.48±5.85 kg body weight. The average completion time of the 2,000 m race simulation, performed on the ergometer, was 409.8±17.19 seconds, with a 4.19% coefficient of variation (CV) and a uniform distribution throughout the menstrual cycle (29.46±2.72 days), as shown in Table I.

Based on O_{2exp} consumption, production of CO_{2exp}, and RER value, the total ATP (adenosine triphosphate), CP (phosphocreatine), as well as muscle glycogen activity was estimated. Thus, muscle ATP was active in group G1 for 10.46±2.66 seconds, while ATP+CP was active for 104.8±54.81 seconds, a period characterized by ATP resynthesis and lipid utilization as an energy resource. However, the contribution of muscle glycogen was established in time units at 303.7±53.93 seconds during the 2,000 m race simulation, the estimation of fat and carbohydrate consumption during the race being possible (Fig. I).

Group G2 consisted of 12 elite female rowers with an average age of 19.25±1.35 years, 180.3±3.82 cm height and 71.33±3.79 kg body weight. The average completion time during the 2,000 m race simulation was 432.2±6.81 seconds, with a 1.58% coefficient of variation. The group had a different distribution of the menstrual cycle than group G1 (Table II).

The average activation time for muscle ATP was 13.50±2.61 seconds, while in the case of ATP+CP we identified a total activation time of 80.28±29.48 seconds, lower than the value determined in group G1. At the same time, the distribution of energy through muscle glycogen, representing carbohydrates, was estimated to a total of 352±32.8 seconds, associated with a high proportion of time spent in effort. Energy costs rose to a value of 103.2±10.65 kcal, in relation to a CHO consumption of 23.55±2.62 g and 0.80±0.32 g fat consumption over the 2,000 m race simulation (Fig. 1).

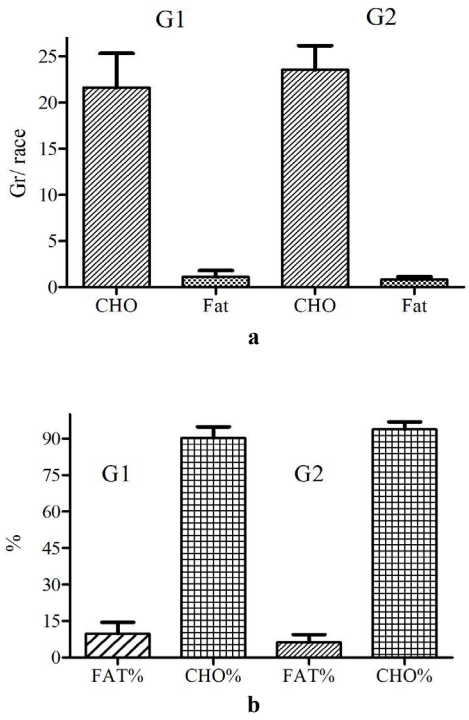

Fig. 1a, b – Macronutrient distribution in the two groups during the 2,000 m race simulation.

For the analysis undertaken in the study groups, we identified statistically significant differences concerning total ATP+CP activation time ($p=0.0085$), an increase in group G1 being identified. However, the contribution of muscle glycogen, in the present study, increased in G2 compared to G1 ($p=0.0135$), without any difference in the total energy consumption during exercise ($p=0.3270$). Regarding respiratory parameters, VO_2 had a favorable value in the case of group G1 compared to group G2 ($p=0.0152$), but without a statistical difference being identified between the two groups regarding parameters such as VCO_2, VE/VO_2, VE/VCO_2, METS, VT, O_{2exp}, CO_{2exp}, $FetO_2$, $FetCO_2$. The respiratory exchange ratio (RER) underwent an increase in group G2, without being statistically significant (Table III).

Table III
Comparative data between G1 and G2 regarding cardiorespiratory evolution over 2,000 m

Parameter	Data reported						
	G1	G2	*p*	*t*	R squared	95% Confidence Interval of the Difference	
						Lower	Upper
Muscular ATP (s)	10.46±0.73	13.50±0.75	*0.0085	2.876	0.2645	-5.225	-0.8523
ATP+CP (s)	104.8±15.20	80.28±5.51	0.1826	1.374	0.07590	-12.38	61.39
Muscle glycogen (s)	303.7±14.96	352.0±9.46	*0.0135	2.677	0.2376	-85.65	-10.98
Kcal/race (kcal)	98.96±2.93	103.2±3.07	0.3270	1.002	0.04179	-13.05	4.538
CHO/race (g)	21.63±1.02	23.55±0.75	0.1527	1.479	0.08684	-4590	0.7634
Fat/race (g)	1.124±0.18	0.80±0.09	0.1526	1.480	0.08961	-0.1273	0.7667
VO_2 (ml/min)	3740±74.28	3471±70.23	*0.0152	6.624	0.2304	56.94	481.7
VCO_2 (ml/min)	3943±81.90	3729±88.31	0.0887	1.778	0.1208	-35.03	462.6
VE (ml/min)	118.6±3.39	115.5±3.44	0.5290	0.6393	0.01746	-6.826	13.12
METS	14.36±0.34	13.94±0.31	0.3770	0.9008	0.03408	-0.5476	1.392
VT (l)	2.078±0.08	2.130±0.06	0.6405	0.4732	0.009644	-0.2769	0.1738
O_{2exp} (ml)	354.3±14.73	367.0±12.32	0.5191	0.6548	0.01830	-52.77	27.40
CO_{2exp} (ml)	85.96±3.16	85.80±3.01	0.9719	0.03558	0.0000	-8.913	9.225
$PetO_2$ (mmHg)	110.7±0.62	113.0±0.76	*0.0310	2.298	0.1867	-4.292	-0.2249
Fat (%)	9.78±1.28	6.30±0.91	*0.0408	2.168	0.1696	0.1583	6.799
CHO (%)	90.32±1.27	93.76±0.90	*0.0404	2.172	0.1702	-6.729	-0.1638

*Statistically significant ($p<0.05$)

The contribution of muscle glycogen associated to a RER value ≥1.0 within the study group increases in association with a reduced average age - G2 - (p=0.0004, r=-0.6576, 95%CI=- 0.8356 to -0.3545). Due to these changes, the total consumption of energy during a race seems to be higher in the medium-low age groups, being influenced by the total time spent in effort (p=0.0187, r=-0.4665, 95%CI=-0.7276 to -0.08739). At the same time, total carbohydrate consumption in the study group is superior in the medium-low age groups - G2 - (p=0.0041, r=-0.5541, 95%CI=- 0.778 to -0.2034), while total fat consumption during the 2,000 m race simulation seems to increase with age (p=0.0270, r=0.4418, 95%CI=0.05641 to 0.7126) (Figure II).

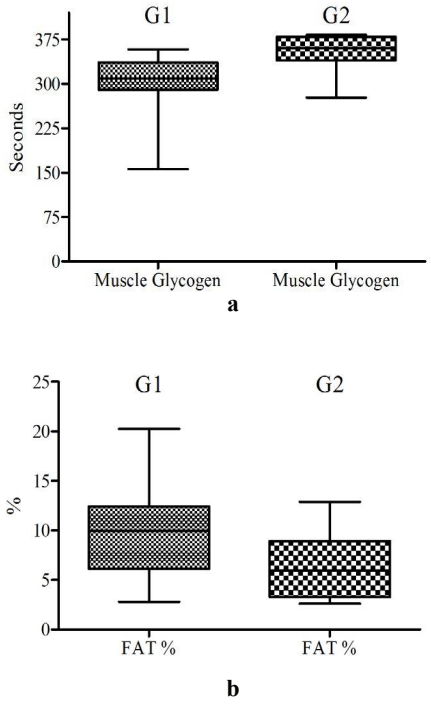

Fig. 2 a, b – Illustration of statistically significant differences in total carbohydrate and fat ratio during the race.

The overall performance time was recorded in the study group G1 (p=0.0027, r=-0.5745, 95%CI=-0.7903 to -0.2319). At the same time, the energy cost of the ≥22 age group appears to be low. It can be noted that the total ATP+CP activation time tends to increase with age in athletes (p=0.0091, r=0.5107, 95%CI=0.1447 to 0.7538). Thus, carbohydrate intake decreases during the race in group G1, while it increases in group G2 (p=0.0041, r=-0.5541, 95%CI=-0.7788 to -0.2034), along with a directly proportional increase with age in total fat consumption (p=0.0270, r=0.4418, 95%CI=0.05641 to 0.7126). The respiratory exchange ratio, representing a direct indicator of energy balance in the study group, increases in conjunction with a low age, the most elevated values being encountered in group G2, with a reduction in group G1 (p=0.0236, r=-0.4512, 95%CI=-0.7183 to -0.06818).

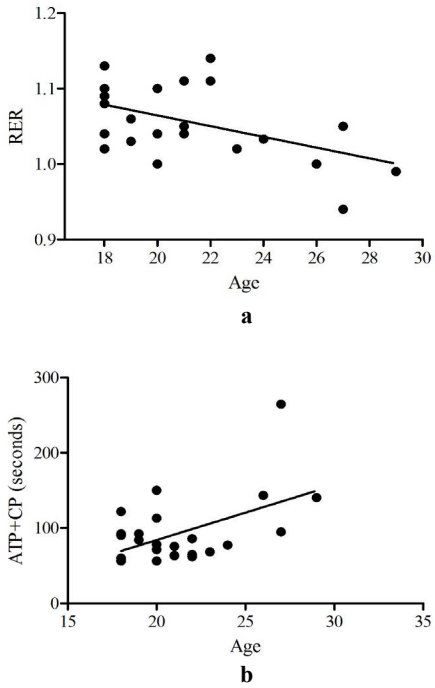

Fig. 3 a, b – Adaptation of respiratory parameters directly related to age (G1-G2).

Discussion

The adjustment and modification of human metabolic parameters is influenced through training, its status and planning within the competitive season. Both the aerobic capacity (McNarry & Jones et al., 2014) and the anaerobic capacity of junior and youth athletes are trainable, with differences according to age and level of training (Matos et al., 2007).

This study confirmed, in this sample of athletes, the hypothesis according to which the junior and youth categories of athletes have a higher glycolytic capacity, the body reaching an elevated RER during specific maximal effort, compared to senior athletes. All changes may be dictated by the VO_2 value and how it affects energy metabolism (Bishop et al., 2002), adapting the body's ability to use various energy sources during exercise. The VO_2 difference between the two groups, G1 (3740 ml/min) and G2 (3471 ml/min), imposed an increase in carbohydrate consumption in group G2, which had a lower average age (19.25±1.35 years) than group G1 (23.08±3.30 years), which at a superior VO_2 value had an increase in fat consumption during the race, in the first 60 seconds spent in effort. Moreover, research conducted until now emphasizes a possible VO_{2max} value reduction for junior and young female athletes due to fat mass changes in the period before puberty (Baxter-Jones et al., 1993). The specificity of anaerobic effort, in oxygen debt, imposes a series of physiological changes. Thus, anaerobic effort is characterized by acidity; as a result, the body's ability to perform a new effort at a similar intensity, appropriate to the body's maximum capacity (Martin et al., 2016), will be reduced for the following 70 hours after the completion of the initial effort. From a practical standpoint, the body's acidity during effort can be buffered by the athlete's aerobic capacity.

In association with the results obtained, a series of parameters may be included. Thus, gas exchange occurring at cellular level, where both O_{2exp} and CO_{2exp} will run at mitochondrial level, depending on the quality of the exchange and the products, will influence the respiratory exchange rate and the final amount of energy required by the actual effort (Qureshi, 2014). Such changes will be associated with the accumulation of lactic acid, a reduction in muscle pH, along with an increase in $PetO_2$ and a reduction in $PetCO_2$. Also, conducting a prolonged effort at an RER value ≥1.10 is often associated with a significant increase in lactic acid, which could compromise the effectiveness and continuity of the effort through acid-base imbalances and total activity imbalance (Martin & Tomescu, 2016b). Thus, junior and youth athletes have a higher ability to adapt during effort, having a proper buffering capacity, due to the growth process and increased development efficiency, reducing the acidity that the body produces during maximal effort. From a practical standpoint, the transition of athletes during different training seasons, and the activity performed alongside the maximal effort will define specific competitive effort. As a result, the energy system based on lactic acid, specific to a maximal effort, represents the glycolytic pathway energy supply formula during which ATP production will occur in the muscles after an incomplete degradation of carbohydrate in two moles of lactate (Gropper et al, 2013), an action that can be amplified in the junior-youth groups compared to senior groups, whose glycolytic system may be reduced due to buffering capacity. Moreover, the capture of a small amount of oxygen in ATP synthesis is identified in group G1, but this action will not hold the supply of energy (Baker et al., 2010; Buford et al., 2007), and at the same time phosphocreatine hydrolysis will not be dependent on the presence of oxygen; so ATP resynthesis will be continued during the effort, as long as this energy source will meet the demands imposed by the body and the level of phosphocreatine will be increased, the process of carbohydrate distribution taking place to support the effort conducted.

The actions referred to are dependent on the VO_2 value and aerobic capacity; thus, the adaptability of young athletes will be effective with the provision of energy, based on a high respiratory exchange ratio and a dependent carbohydrate use during effort, with a reduction of lipid substrate, in ATP and phosphocreatine resynthesis, in groups with a low adaptation capacity to exercise, along with the buffering compounds produced during effort. However, a program that provides frequent maximal efforts in youth and junior athlete groups will be associated with hastened training and lack of efficiency regarding the body's adaptation in later training stages of elite athletes.

Conclusions

1. In the study group, we reported an increased respiratory exchange ratio for subjects with younger ages, changing the energy substrate and macronutrient distribution including total energy costs during the 2,000 m race simulation.

2. Increased time spent in maximum effort will increase the proportion of carbohydrate during its use. However, the final ratio and the link between age and the respiratory exchange ratio, whose value reaches the upper limit, along with O_{2exp} and carbohydrate or lipid determinations, suggest an increased carbohydrate consumption during maximal effort, related to a smaller reported age, and a high monitored respiratory exchange ratio ≥1.1.

3. ATP or CP product transition was reduced in group G2, with a slight increase in group G1. The increase of these parameters, in time units, was associated with an elevated VO_2 value, and with possible considerations regarding mitochondrial and energy system efficiency.

4. The measurements completed in group G2 showed that the group had an increased glycolytic capacity in association with oxygen debt, thus, theoretically it may be possible to identify a certain elevated lactate value.

5. Metabolic costs during maximum effort are increased in group G2 compared to group G1, being associated with an increased VO_2, a higher aerobic capacity and a lower buffering capacity, but a longer recovery time, unlike in group G2, in terms of age and physical adaptation.

Conflicts of interest

There are no conflicts of interest regarding the results, methods and conclusions submitted.

References

Baker JS, McCormick MC, Robergs RA. Interaction among Skeletal Muscle Metabolic Energy Systems during Intense Exercise. J. Nutr. Metabol. 2010, Article ID 905612. doi: 10.1155/2010/905612.

Baxter-Jones A, Goldstein H, Helms P. The development of aerobic power in young athletes. J Appl Physiol. 1993;75(3):1160-1167.

Bishop D, Bonetti D, Dawson B. The influence of pacing strategy on VO2 and supramaximal kayak performance. Med Sci Sports Exerc. 2002;34(6):1041-1047.

Buford TW, Kreider RB, Stout JR, Greenwood M. International Society of Sports Nutrition position stand: creatine supplementation and exercise. J Int Soc Sports Nutr. 2007;4:6.

Gropper SAS, Smith JL. Advanced nutrition and human metabolism. Belmont, CA: Wadsworth/Cengage Learning, 2013.

Hoch AZ, Goossen K, Kretschmer T. Nutritional requirements of the child and teenage athlete. Phys Med Rehabil Clin N Am. 2008;19(2):373-398.

Isacco L, Duché P, Boisseau N. Influence of hormonal status on substrate utilization at rest and during exercise in the female population. Sports Med. 2012;42(4):327-342.

Marcus MD, Loucks TL, Berga SL. Psychological correlates of functional hypothalamic amenorrhea. Fertil Steril. 2001;76(2):310-316.

Martin ŞA, Tomescu V. Effects of menstrual period on daily energy demands in a group of elite female rowers. Medicina Sportiva. 2016a;XII(1): 2709-2714.

Martin ŞA, Tomescu V, Voidăzan S. Energy Systems Efficiency Influences The Results Of 2,000 M Race Simulation Among Elite Rowers. Clujul Medical, 2016, Ahead of Print, DOI: 10.15386/cjmed-675.

Martin ŞA, Tomescu V. The Respiratory Exchange Ratio in Athletes' Nutritional Practice. AMT, 2016b;21(2):57-60.

Matos N, Winsley RJ. Trainability of Young Athletes and Overtraining. J Sports Sci Med. 2007; 6(3): 353-367.

McCartney N, Spriet LL, Heigenhauser GJ, Kowalchuk JM, Sutton JR, Jones NL. Muscle power and metabolism in maximal intermittent exercise. J Appl Physiol. 1986;60(4):1164-1169.

McNarry M, Jones A. The influence of training status on the aerobic and anaerobic responses to exercise in children: a review. Eur J Sport Sci. 2014;14(Suppl 1):S57-68. doi: 10.1080/17461391.2011.643316.

Qureshi SM. Measurement of respiratory function: an update on gas exchange. Anaesth Intens Care Med. 2014;12(11):490-495.

Reaburn P, Dascombe B. Anaerobic performance in masters athletes. Eur Rev Aging Phys Act. 2009;6(1):39-53.

Reaburn P, Dascombe BJ. Endurance exercise performance in Masters Athletes: age-associated changes and underlying physiological mechanisms. J Physiol. 2008;586(Pt 1):55-63.

Tanaka H, Seals DR. Invited Review: Dynamic exercise performance in Masters Athletes: insight into the effects of primary human aging on physiological functional capacity. J Appl Physiol. 2003;95(5):2152-2162.

Uranga AP, Levine J, Jensen M. Isotope tracer measures of meal fatty acid metabolism: reproducibility and effects of the menstrual cycle. Am J Physiol 2005;288(3): E547-555.

Weber CL, Schneider DA. Increases in maximal accumu- lated oxygen deficit after high-intensity interval training are not gender dependent. J Appl Physiol. 2002;92(5):1795–1801.

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The effect of BCAA supplementation on the oxidant/ antioxidant balance during physical exercise

Efectul suplimentării cu BCAA asupra balanţei oxidanţi/ antioxidanţi în efortul fizic

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Abstract

Background. Experimental studies have shown that branched-chain amino acids (BCAA) can downregulate the expression of some antioxidant (AO) genes and alter tissue redox homeostasis in the brain.

Aims. The increase of oxidative stress (OS) during intense exercise and the increase of AO defense during moderate exercise led us to study the effect of BCAA supplementation on aerobic exercise capacity (AEC) and biochemical redox profile.

Methods. The research was performed in 6 groups (n=10 animals/group): group I – controls, group II – controls + exercise (5% load), group III – controls + exercise (10% load), group IV – BCAA, group V – BCAA + exercise (5% load), group VI – BCAA + exercise (10% load). AEC was determined by the swimming test, the measurements for the O/AO balance were performed for malondialdehyde (MDA) and total sulfhydryl (SH) groups.

Results. Our research shows the energogenic effect of BCAA supplementation, with the increase of AEC after chronic administration for 28 days, and the systemic effect of AO in exercise trained animals. BCAA supplementation causes an alteration of redox homeostasis, with the increase of AO defense in the serum of exercise trained animals, an effect that is not reported in the literature, which might contribute to the increase of exercise capacity.

Conclusions. BCAA supplementation determines: an increase of exercise capacity in animals compared to unsupplemented controls and to initial values; a significant increase of AO defense in the serum of sedentary animals; a significant increase of AO defense in the serum of exercise trained animals.

Key words: BCAA, aerobic exercise capacity, oxidant/antioxidant balance, oxidative stress.

Rezumat

Premize. Unele studii experimentale au aratat că aminoacizi esenţiali cu lanţ ramificat (branched-chain amino acids) (BCAA) pot hiporegla expresia unor gene antioxidante (AO) şi altera homeostazia redox tisulară în creier.

Obiective. Creşterea stresului oxidativ (SO) în cursul efortului fizic intens şi creşterea apărării AO în efortul fizic moderat ne-a determinat să studiem efectul suplimentării cu BCAA asupra capacităţii aerobe de efort (CAE) şi profilului biochimic redox.

Metode. Cercetările au fost efectuate pe 6 loturi (n=10 animale/lot): lotul I - martori, lotul II - martori + efort (încărcare 5%), lotul III - martori + efort (încărcare 10%), lotul IV - BCAA, lotul V - BCAA + efort (încărcare 5%), lotul VI - BCAA + efort (încărcare 10%). CAE s-a determinat prin proba de înot, determinările pentru balanţa O/AO s-au realizat pentru malondaldehidă (MDA) şi pentru grupările sulfhidril totale (SH).

Rezultate. Cercetările noastre arată efectul energogen al suplimentului de BCAA, cu creşterea CAE după administrarea cronică timp de 28 zile şi efectul AO la nivel sistemic, efect prezent la animalele antrenate. Suplimentarea cu BCAA determină modificarea homeostaziei redox, cu creşterea apărării AO la nivel seric la animalele antrenate la efort, efect nesemnalat în literatură, ceea ce ar putea contribui la creşterea capacităţii de efort.

Concluzii. Suplimentarea cu BCAA determină: creşterea capacităţii de efort la animale faţă de martorii nesuplimentaţi şi faţă de valorile iniţiale; creşterea semnificativă a apărării AO la nivel seric la animalele sedentare; creşterea semnificativă a apărării AO la nivel seric la animalele antrenate la efort.

Cuvinte cheie: BCAA, capacitate aerobă de efort, balanţa oxidanţi/antioxidanţi, stres oxidativ.

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Introduction

The use of energogenetic means to increase physical performance is based on the quantitative use and qualitative requirements of macronutrients: carbohydrates, lipids and proteins, and micronutrients in various sports.

A supplement widely used by athletes is represented by essential and non-essential amino acids, basic components of proteins, involved in physical exercise.

AA play the following roles in physical exercise:

- an indirect energogenic role;
- a plastic trophotropic role on muscle mass and optimization of protein anabolism, with positive effects on nitrogen balance;
- an indirect functional role of transport and use of O_2 in active tissues (HIS), an antioxidant role in musculoskeletal tissue (His, Cys, Glu), muscle vasodilation (Arg), prevention and diminution of muscle fatigue (Asp), an immunostimulatory effect (Gly), a glucogenic and protective role of muscle glycogen (Glu, Asp), a cytoprotective effect on muscle enzymes during exercise - taurine (Dudgeon et al., 2015) and a decrease of adipose mass.

A preparation based on a triad of essential branched-chain amino acids: L-leucine, L-isoleucine and L-valine (BCAA) is frequently used/recommended by/for athletes. Of these, the most studied one, which can apparently provide the most benefits, is leucine.

BCAA are anabolizing supplements, which increase muscle resistance, playing an important role in muscle protein metabolism, being oxidized in muscle and representing the main source of calories. They produce glycogen having a gluconeogenetic role, balancing insulin secretion.

L-leucine is involved in hemoglobin formation, stabilization of glycemia, muscle anabolism, energogenesis. L-isoleucine plays a role in muscle anabolism and harmonious muscle distribution. L-valine is involved in muscle development, muscle anabolism and glucose formation (Jafari et al., 2016; Chen et al., 2016; Gil & Kim, 2015).

Although BCAA are abundant in the normal daily diet, they are the only AA that are not decomposed in the liver; the ingested BCAA amount is directly found in the plasma and peripheral tissues, particularly muscle and adipose tissue (Layman, 2003).

Other studies have shown that BCAA administration has beneficial effects in various diseases, in patients, for the improvement of protein synthesis, hepatic encephalopathy, insulin resistance, suppression of hepatocarcinoma, with the increase of the survival rate and the improvement of the quality of life (Jia et al., 2014; Sun & Wang, 2014).

Experimental studies have shown that BCAA can downregulate the expression of antioxidant genes and alter tissue redox homeostasis in the brain (Piscopo et al., 2011).

A number of studies have evidenced the favorable effects of the administration of BCAA supplements in endurance athletes (Gil & Kim 2015; Jafari et al., 2016; Dieter et al., 2016).

Favorable aspects have been attributed to the anti-fatigue and energogenic effects (Chen et al., 2016; Dudgeon et al., 2016); to the stimulation of protein synthesis and the role of signal molecules for cell growth and metabolism regulation (Sun & Wang, 2014); to the antiinflammatory role in skeletal muscle (Buonocore et al., 2015), and to the reduction of muscle lesions during exercise.

Hypothesis

The favorable effects of BCAA supplements on aerobic exercise capacity and the antioxidant effect of moderate physical exercise led us to study the influence of BCAA supplementation on redox homeostasis in animals subjected to exercise.

Material and methods

Research protocol

The research took place at the Ambulatory Sports Medicine Clinic and was approved by its manager, by the Ethics Board of the "Iuliu Hatieganu" University of Medicine and Pharmacy Cluj-Napoca, and the informed consent of the subjects was obtained.

a) Period and place of the research

The experimental study was performed on male Wistar rats from the Biobase of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca. The rats had a mean weight of 180-190 grams and were aged 16 weeks old. The study was approved by the Ethics Board, according to the Good Practice Guidelines. The requirements of the Helsinki Declaration, Amsterdam Protocol, Directive 86/609/EEC and the regulations of the Bioethics Commission of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca were met. The research was carried out in the Experimental Research Laboratory of the Department of Physiology of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca.

b) Subjects and groups

The measurements were performed in 6 groups of rats (n=10 animals/group):

Group I – controls
Group II – controls + exercise (5% load)
Group III – controls + exercise (10% load)
Group IV – BCAA
Group V – BCAA + exercise (5% load)
Group VI – BCAA + exercise (10% load)

BCAA (Natural Plus Preparation) were administered by oropharyngeal gavage, in a dose of 0.1 ml per rat, calculated in relation to the daily dose recommended for humans. The ratio between the amino acids (AA) in the preparation was 2:1:1 (1000 mg L-leucine, 500 mg L-isoleucine and 500 mg L-valine). The administered amount was 30 mg/animal/day for 28 days.

c) Tests applied

The aerobic exercise capacity (AEC) was determined by the swimming test, which was carried out in a plastic pool, with thermostatic water at 20°C. The pool had the following characteristics: length 100 cm, width 40 cm, height 60 cm, water level 30 cm (Nayanatara et al., 2005).

The value of AEC was calculated by measuring the length of time, expressed in seconds, from the time of placement of the animals in the pool to their exhaustion (refusal to swim).

The intensity of exercise was changed by loading the

Table I

Comparative analysis of aerobic exercise capacity values (measured in sec) in the studied groups and statistical significance

Time	Group	Mean	SE	Median	SD	Min.	Max.	Statistical significance (p)		
T1	II	321	10.7703	310	34.0588	290	385	T1-T14-T28	II	< 0.001
	III	292	7.0427	292.5	22.2711	255	325		III	< 0.001
	V	336	6.3666	330	20.1329	306	375		V	< 0.001
	VI	328	6.3386	323	20.0444	306	368		VI	< 0.001
T14	II	428	11.0000	420	34.7851	385	482	II	T1-T14	< 0.01
	III	382	11.3490	385	35.8887	335	430		T1-T28	< 0.01
	V	427	4.9058	423.5	15.5134	406	456		T14-T28	< 0.001
	VI	423	4.5631	422	14.4299	405	450	III	T1-T14	< 0.001
T28	II	525	8.2476	524.5	26.0811	495	560		T1-T28	< 0.001
	III	503	4.8120	504	15.2169	469	520		T14-T28	< 0.001
	V	623	6.9730	619	22.0504	595	669	V	T1-T14	< 0.001
	VI	645	10.0786	644.5	31.8713	600	698		T1-T28	< 0.001
		Time	II-III-V-VI	II-III	V-VI	II-V	III-VI		T14-T28	< 0.001
Statistical significance (p)		T1	< 0.01	NS	NS	NS	< 0.01		T1-T14	< 0.01
		T14	< 0.01	< 0.01	NS	MNS	< 0.01	VI	T1-T28	< 0.001
		T28	< 0.001	< 0.05	NS	< 0.001	< 0.001		T14-T28	< 0.001

animals with different weights, 5% and 10% of the animal's weight, in the standard linear loading variant.

The duration of the experiment was 28 days. The studied days were day 1 (T1), day 14 (T14) and day 28 (T28).

Biochemical determinations were performed in the Laboratory for the Study of Oxidative Stress of the Department of Physiology of "Iuliu Haţieganu" UMPh Cluj-Napoca. For the measurement of the indicators of the O/AO balance in the blood, venous blood samples were taken from the retro-orbital sinus. The serum was separated from the collected blood by centrifugation, for the measurement of the indicators.

Malondialdehyde (MDA) was measured using the fluorescence method, according to Conti et al., (1991). Concentration values were expressed in mol/ml. Total sulfhydryl (SH) groups were measured using the method of Hu (1994). Concentration values were expressed in µmol/ml.

d) Statistical processing

Statistical processing was performed using the StatsDirect v.2.7.2 software, with the OpenEpi 3.03 application and the Excel application (Microsoft Office 2010). The results were graphically represented using the Excel application (Microsoft Office 2010).

Results

a) Aerobic exercise capacity (Table I, Fig. 1).

The exercise capacity was studied in groups II, III (control groups) and V, VI (groups supplemented with BCAA) at 3 time points (T1, T14 and T28).

The statistical analysis of aerobic exercise capacity values, considering all groups, showed the following:

- very statistically significant differences between at least two of the groups at times T1 and T14 ($p < 0.01$)
- highly statistically significant differences between at least two of the groups at time T28 ($p < 0.001$).

The statistical analysis of aerobic exercise capacity values, considering all time points, evidenced highly statistically significant differences between at least two of the studied time points in all four groups ($p < 0.001$).

The statistical analysis of the aerobic exercise capacity values for unpaired samples showed the following:

- at time T1: very statistically significant differences between groups III-VI ($p < 0.01$);
- at time T14: very statistically significant differences between groups II-III and III-VI ($p < 0.01$);
- at time T28: highly statistically significant differences between groups II-V and III-VI ($p < 0.001$), statistically significant differences between groups II-III ($p < 0.05$).

The statistical analysis of the aerobic exercise capacity values for paired samples indicated:

- in group II - very statistically significant differences between times T1-T14 and T1-T28 ($p < 0.01$); highly statistically significant differences between times T14-T28 ($p < 0.001$)
- in group III - highly statistically significant differences between times T1-T14, T1-T28 and T14-T28 ($p < 0.001$)
- in group V - highly statistically significant differences between times T1-T14, T1-T28 and T14-T28 ($p < 0.001$)
- in group VI - very statistically significant differences between times T1-T14 ($p < 0.01$); highly statistically significant differences between times T1-T28 and T14-T28 ($p < 0.001$).

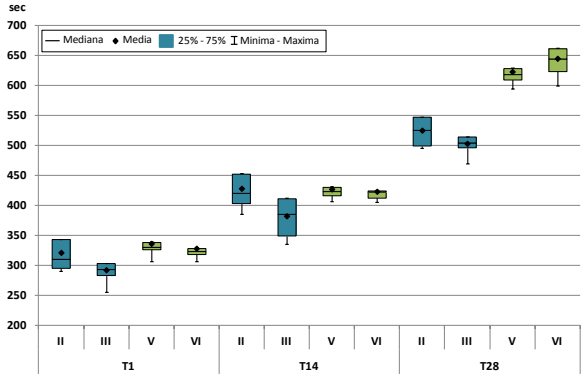

Fig. 1 – Aerobic exercise capacity in the 4 studied groups

b) The O/AO balance in the serum (Table II, Fig. 2 & Table III, Fig. 3).

The statistical analysis of malondialdehyde (MDA) values, considering all control groups, showed very

Table II

Comparative analysis of malondialdehyde values (measured in nmol/ml) in the studied groups and statistical significance

Group	Mean	SE	Median	SD	Min.	Max.	Statistical significance (p)			
I	1.467	0.0875	1.476	0.2768	1.002	1.944	I-II-III	< 0.01	IV-VI	NS
II	1.717	0.1675	1.545	0.5298	0.979	2.697	IV-V-VI	< 0.01	V-VI	< 0.001
III	2.023	0.0676	2.130	0.2138	1.712	2.238	I-II	NS	I-IV	< 0.05
IV	1.905	0.1661	1.916	0.5253	1.278	3.109	I-III	< 0.001	II-V	NS
V	1.687	0.0917	1.650	0.2898	1.221	2.314	II-III	NS	III-VI	NS
VI	2.240	0.1525	1.997	0.4822	1.920	3.448	IV-V	NS	nmol/ml	

Table III

Comparative analysis of SH values (measured in µmol/ml) in the studied groups and statistical significance.

Group	Mean	SE	Median	SD	Min.	Max.	Statistical significance (p)			
I	0.128	0.0123	0.124	0.0388	0.083	0.197	I-II-III	< 0.05	IV-VI	NS
II	0.150	0.0076	0.154	0.0239	0.111	0.179	IV-V-VI	NS	V-VI	NS
III	0.166	0.0044	0.163	0.0140	0.143	0.192	I-II	NS	I-IV	< 0.01
IV	0.182	0.0075	0.188	0.0238	0.143	0.214	I-III	< 0.05	II-V	< 0.01
V	0.190	0.0094	0.183	0.0297	0.158	0.255	II-III	NS	III-VI	< 0.05
VI	0.190	0.0073	0.185	0.0229	0.164	0.225	IV-V	NS	µmol/ml	

Table IV

Statistical analysis of correlation between the values of the studied serum indicators

Indicators		Group I		Group II		Group III		Group IV		Group V		Group VI	
MDA -	SH	0.3423	**	0.2253	*	0.2121	*	0.3082	**	-0.1026	*	-0.0545	*

Correlations: **** very good, *** good, ** acceptable, * weak.

statistically significant differences between at least two of the groups ($p < 0.01$).

The statistical analysis of MDA values, considering all groups with BCAA supplementation, evidenced very statistically significant differences between at least two of the groups ($p < 0.01$).

The statistical analysis of MDA values for unpaired samples showed:

- highly statistically significant differences between groups I-III, V-VI ($p < 0.001$)
- statistically significant differences between groups I-IV ($p < 0.05$).

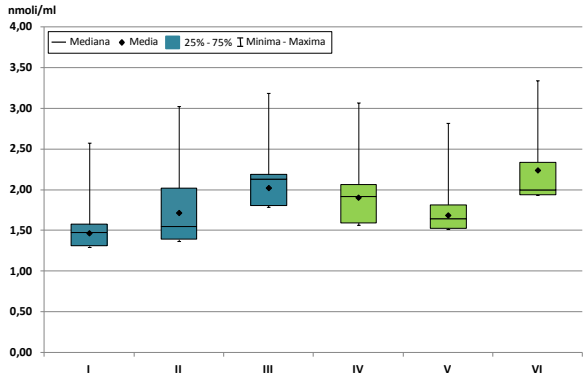

Fig. 2 – Serum MDA in the 6 studied groups.

The statistical analysis of sulfhydryl (SH) group values, considering all control groups, evidenced statistically significant differences between at least two of the groups ($p < 0.05$).

The statistical analysis of SH values, considering all groups with BCAA supplementation, showed no statistically significant differences between the groups ($p > 0.05$).

The statistical analysis of SH values for unpaired samples showed: very statistically significant differences between groups I-IV, II-V ($p < 0.01$); statistically significant differences between groups I-III, III-VI ($p < 0.05$).

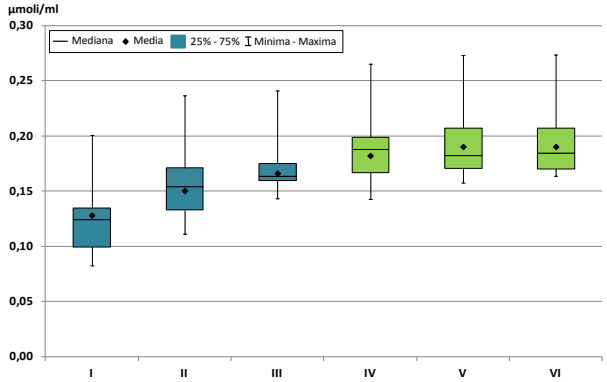

Fig. 3 – Serum SH groups in the 6 studied groups.

c) The O/AO balance (Table IV).

The statistical analysis of correlation between the values of the studied indicators showed:

- for group I, an acceptable positive correlation between MDA-SH;
- for group IV, an acceptable positive correlation between MDA-SH.

Table V

Statistical analysis of correlation between the values of the serum indicators of the O/AO balance and aerobic exercise capacity in the studied groups.

Indicators		Group II		Group III		Group V		Group VI	
AEC -	MDA	0.0697	*	0.3110	**	-0.2168	*	0.2606	**
	SH	-0.3028	**	-0.1896	*	-0.4723	**	-0.4942	**

Correlations: **** very good, *** good, ** acceptable, * weak.

d) The statistical analysis of correlation between the values of AEC and the indicators of the O/AO balance (Table V) showed for:

- group II, an acceptable negative correlation with SH
- group III, an acceptable positive correlation with MDA
- group V, an acceptable negative correlation with SH
- group VI, an acceptable negative correlation with SH and an acceptable positive correlation with MDA.

Discussions

BCAA supplementation in sedentary animals was performed in group IV compared to group I. Significant increases of serum MDA and SH were found.

BCAA supplementation in exercise trained animals shows: for group V compared to group II, significant increases of SH groups in the serum; for group VI compared to group III, significant increases of SH groups in the serum.

The comparative effect of BCAA supplementation in exercise trained animals, studied in group VI compared to group V, evidences significant increases in serum MDA.

Our results show the energogenic effect of BCAA supplementation, with the increase of AEC after chronic administration for 28 days, and the systemic AO effect, present in trained animals.

Our data are in agreement with the data of other authors, who show the favorable energogenic effect of BCAA preparations in endurance athletes (Dudgeon et al., 2015; Gacek et al., 2016; Jafari et al., 2016) and in animals (Chen et al., 2016), through provision of muscle energy and prolongation of resistance exercise. A study carried out by Gualano et al. (2011) demonstrated that BCAA supplementation increases resistance to fatigue and promotes lipid oxidation in subjects undergoing an exercise protocol for exhaustion of glycogen resources, and subsequently subjected to an exercise test until exhaustion.

BCAA supplementation causes an alteration of redox homeostasis, with the increase of serum AO defense in exercise trained animals, an effect unreported in the literature, which might contribute to the increase of AEC.

BCAA can be considered a beneficial supplement for high performance athletes, contributing to muscle recovery by promoting protein synthesis in muscle, by limiting muscle lesions during exercise, and to the regulation of the immune system (Negro et al., 2008; Shimomura et al., 2004; Howatson et al., 2012).

Conclusions

1. BCAA supplementation causes an increase of exercise capacity in animals compared to unsupplemented controls and to initial values.

2. BCAA supplementation induces a significant increase of AO defense in the serum of sedentary animals and exercise trained animals.

3. The oxidant/antioxidant balance does not show significant serum changes in animals supplemented with BCAA and subjected to exercise at different intensities.

Conflicts of interest

Nothing to declare.

Acknowledgements

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References

Buonocore D, Negro M, Arcelli E, Marzatico F. Anti-inflammatory Dietary Interventions and Supplements to Improve Performance during Athletic Training. J Am Coll Nutr. 2015;34 (Suppl 1):62-67.

Conti M, Morrand PC, Levillain P, Lemonnier A. Improved fluorometric determination of malonaldehyde. Clin Chem. 1991;37(7):1273-1275.

Chen YM, Che LL ,Wei L, Hsu YL,Chen KN,Huang CC, Kao CH. Sake Protein Supplementation Affects Exercise Performance and Biochemical Profiles in Power-Exercise-Trained Mice. Nutrients. 2016;8(2):106. doi: 10.3390/nu8020106.

Dieter BP, Schoenfeld BJ, Aragon AA. The data do not seem to support a benefit to BCAA supplementation during periods caloric restriction. J Int Soc Sports Nutr. 2016;13:21. doi: 10.1186/s12970-016-0128-9.

Dudgeon WD, Kelley EP, Scheett TP. In a single-blind, matched group design: branched-chain amino acid supplementation and resistance training maintains lean body mass during a caloric restricted diet. J Int Soc Sports Nutr. 2016;13:1. doi: 10.1186/s12970-015-0112-9.

Dudgeon WD, Kelley EP, Scheett TP. Effect of Whey Protein in Conjunction with a Caloric-Restricted Diet and Resistance Training. J Str Cond Res. 2015;10.1519/JSC.

Gacek M. Association between general self-efficacy level and use of dietary supplements in the group of American football players. Rocz Panstw Zakl Hig. 2016;67(1):31-36.

Gil JH, Kim CK. Effects of different doses of leucine ingestion following eight weeks of resistance exercise on protein synthesis and hypertrophy of skeletal muscle in rats. J Exer Nutr Biochem. 2015;19(1):31-38.

Gualano AB, Bozza T, Lopes De Campos P, Roschel H, Dos Santos Costa A, Marquezi LM, Benatti F, Herbert Lancha Junior A. Branched-chain amino acid supplementation enhances exercise capacity and lipid oxidation during endurance exercise after muscle glycogen depletion. J Sports Med Phys Fitness. 2011;51(1):82-88.

Howatson G, Hoad M, Goodall S, Tallent J, Bell PG, French DN. Exercise-induced muscle damage is reduced in resistance-trained males by branched chain amino acids:a randomized, double-blind, placebo controlled study. J Int Soc Sports Nutr. 2012;9:20. DOI: 10.1186/1550-2783-9-20.

Hu ML. Measurement of protein thial groups and glutathione in plasma. Methods enzymol. 1994;233:380-385.

Jafari H, Barrett JR, Emhoff W. Effects of Branched-Chain Amino Acid Supplementation on Exercise Performance and Recovery in Highly Endurance-Trained Athletes. FASEB J, 2016;30(1Suppl): lb683.

Jia H, Tamura N, Aw W, Doi M, Kato H. Identification of Branched Chain Amino Acids; Underlying Molecular Pathways Using Transcriptomic Analysis: Application to Cirrhosis. In: Branched Chain Amino Acids in Clinical Nutrition. Vol.2. Rajendram R, Preedy VR, Patel VB (eds), Humana Press, 2014;131-157.

Layman DK. The role of leucine in weight loss diets and glucose homeostasis. J Nutr. 2003;133(1);261S-267S.

Nayanatara AK, Nagaraja HS, Anupama BK. The effect of repetead swimming stress on organ weights and lipid nperoxidation in rats. J Phys Biomed Sci. 2005;18(1):3-9.

Negro M, Giardina S, Marzani B, Marzatico F. Branched-chain amino acid supplementation does not enhance athletic performance but affects muscle recovery and the immune

system. J Sports Med. Phys. Fitness 2008;48(3):347-351.
Piscopo P, Crestini A, Adduci A, Ferrante A, Massari M, Popoli P, Vanacore N, Confaloni A. Altered oxidative stress profile in the cortex of mice fed an enriched branched-chain amino acids diet: possible link with amyotrophic lateral sclerosis? J Neurosci Res. 2011;89(8):1276-1283.
Shinomura Y, Murakami T, Nakai N, Nagasaki M, Harris RA. Exercise promotes BCAA catabolism:effects of BCAA supplementation on skeletal muscle during exercise. J Nutr. 2004;134(6 Suppl):1583S-1587S.
Sun H, Wang Y. Branched Chain Amino Acids in Heart Failure. Branched Chain Amino Acids in Clinical Nutrition. Vol.2. Rajendram R, Preedy VR, Patel VB (eds), Humana Press, 2014,81-88.

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Guidelines of the dual career management in sport
Repere ale managementului dublei cariere în sport

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Abstract

Background. Dual career management elements are closely related to the understanding of the concept "dual career in sport".

Aims. The main objectives were to analyze how to perceive phenomenon "dual career in sport" and the factors involved in sporting career development conducted in parallel with completion of educational and vocational training.

Methods. In the study, the survey method was used. The investigated sample includes 239 athletes - students, graduates or other professions (112 females, 127 males) and 81 coaches (22 females, 59 males). The average age of the subjects was 23 years old for athletes and for coaches, 43 years of age. Administering questionnaires were built on two groups of subjects - coaches and athletes, they were conducted from February to June 2016. For data analysis SPSS and content analysis were used (frequency distribution, $\chi 2$ test of significance, tables Association).

Results. The analysis of the recorded data highlights the declarative knowledge of the concept of dual career in sports (the difference between the two subjects is statistically significant ($\chi 2 = 8.03$; $p = 0.005$) and o different perception of understanding of the phenomenon, on categories of subjects. Thus, 61% of athletes and 77% of coaches claim to be familiar with this concept, although this does not denote definitions assigned. Absences from school due to participation in sport, communication sometimes difficult with teachers, financial problems, sports injuries due to overloading and the reduced period of recovery, the insufficient time for the tasks of sporting performance and the school problems entering the labor market after withdrawal from the sports career, all these are stressful factors for athletes generating career choice making situations.

Conclusions. The conclusions of the study underline the importance of knowledge and appropriate approach to the phenomenon of dual career in sport and the need to develop a legal framework favorable to support young people in achieving athletic and school / academic performance.

Key words: dual career in sport, management, athletes, coaches.

Rezumat

Premize. Managementul elementelor dublei cariere se află în strânsă legătură cu înțelegerea semnificației conceptului „dublă carieră în sport"

Obiective. Principalele obiective au fost analiza modului de percepere a fenomenului "dublă carieră în sport" şi a factorilor care intervin în dezvoltarea carierei sportive desfăşurată în paralel cu parcurgerea programelor educaţionale şi formarea profesională.

Metode. În realizarea studiului a fost utilizată metoda anchetei. Eşantionul investigat cuprinde 239 de sportivi – studenți, absolvenți de studii superioare sau altă profesie (112 feminin, 127 masculin) și 81 de antrenori (22 feminin, 59 masculin). Media de vârstă a subiecților sportivi este de 23 de ani, iar a subiecților antrenori, 43 de ani. Administrarea chestionarelor, construite pe două categorii de subiecți – antrenori și sportivi, a fost realizată în perioada februarie – iunie 2016. Pentru analiza datelor s-a utilizat SPSS (distribuție de frecvență, test de semnificație $\chi 2$, tabele de asociere) și analiza de conținut.

Rezultate. Analiza datelor înregistrate pune în evidenţă cunoaşterea la nivel declarativ a conceptului de dublă carieră în sport (diferenţa între cele două categorii de subiecţi este semnificativă din punct de vedere statistic ($\chi 2=8.03$; $p=0,005$) şi o percepţie diferită a înţelegerii fenomenului, pe categorii de subiecţi. Astfel, 61% din sportivi şi 77% din antrenori susţin că sunt familiarizaţi cu această noţiune, deşi definiţiile atribuite nu denotă acest fapt. Absenţele de la cursuri datorate participării sportive, comunicarea uneori dificilă cu cadrele didactice, problemele financiare, accidentările sportive, timpul insuficient pentru îndeplinirea sarcinilor de performanţă sportivă şi şcolară, problemele de inserţie pe piaţa muncii după retragerea din sport constituie factori stresanţi pentru sportivi, generând situaţii de alegere a carierei.

Concluzii. Concluziile studiului subliniază importanţa cunoaşterii şi abordării adecvate a fenomenului dublei cariere în sport, precum şi necesitatea dezvoltării unui cadru legislativ favorizant care să sprijine tinerii în realizarea performanţelor sportive şi şcolare/academice.

Cuvinte cheie: dublă carieră în sport, management, sportivi, antrenori.

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Introduction

Depending on the stage covered in life, athletes can simultaneously be pupils or students, family members or employees having to manage the requirements of dual careers - athletic and educational / professional. In professional sports, dual career means that a certain period of time a person correlates sport with study in school, leading to a great achievement in sport and acquisition of academic education (Uebel, 2006 cited by Ābeļkalns & Geske, 2013). In Europe, the term "dual career" was recently introduced to indicate "elite athletes facing specific challenges in combining educational requirements (***, 2007) and sports" (Guidotti et al., 2015).

Education and training are important for the personal and professional development of young people and, at an economic level, for the development of a society. Labor market dynamics, high unemployment rates, educational attainment levels of young people are elements which call into uncertainty prospects who have not reached a "professional capital" to facilitate their socio-professional integration. Education, training, youth and sport (***, 2010) is one of the EU actions which aims to develop the European dimension in education, sports, stressing at the same time the importance of policies for education and training of young people engaged in parallel in sports training. Theorists of "sport as education" claim that participation in sport is as important for the development of students as their educational experience, academic implying support in forming adolescents, hence sport should not be treated as an extracurricular activity but as an educational one (Rowles, 2015).

"Profession" of sports is accessible to the majority of population, but is short-lived, starts at an early age, age at which the future of the sport offers prospects for success, and ends with diminishing abilities of athletes if the journey did not intervene of reasons for withdrawal. A small percentage end up being top athletes, achieving gains which will give them a decent living, others, constituting the majority of athletes, reach the end of sporting career without sources of income to help them live a decent life and often without gaining a thorough training by theoretical studies. Making school performance is not an easy action for athletes, "compared to traditional student athletes face additional challenges and energy in achieving good academic performance and sports" (Shuman, 2009, Gaston-Gayles, 2005, Gatmen, 2012, cited by Corrado et al., 2012). Recent research in France made with athletes retired from competitive activities refer to the experience of their study as part of a dual career appreciated both as an opportunity and as a constraint, recognizing workload and the difficulty of combining sport and study; inflexibility on the educational side, making it difficult to manage the two activities (***, 2016). One way to prevent problems of transition from sports career into work is the support of athletes in career planning, raising awareness at this stage, so as to access and develop resources to effectively manage the socio-professional integration (Alfermann & Stambulova 2007 cited by Stambulova, 2010). Going through degree programs for training alongside the sport can be seen as a form of planning withdrawal from competitive activity, an important factor in adapting to "sporting retirement" (Kadlcik & Flemr 2008 cited by Geraniosova & Ronkainen, 2015).

The significance of "dual career" is highlighted in the White Paper on sport, which states that "in order to ensure integration of professional athletes into the labor market at the end of their sport career, the European Commission underlines the importance of taking into account the time, the need to provide young athletes training for a "dual career" and local highly professional training centers, able to safeguard the moral, educational and professional paths of these young people "(***, 2007).

Objectives

The aim of this study was to outline the image of reality of the dual career in sports management in order to identify elements that could contribute to improving business performance management and school sports or the academic one.

The main objectives of the study were the analysis of the period in the life of athletes in combining sport and education and/or training, as well as to identify how the perception of "dual career in sport" is identified and the factors involved in the development of sports career held in parallel with completing educational and training programs.

Material and methods

Research protocol

Data collection and analysis were initiated after informing the subjects and getting the consent to participate in the study.

a) Period and place of the research

Administering questionnaires were conducted from February to June 2016 in the N-V region of the country (Bihor, Bistriţa Năsăud, Cluj, Maramureş, Satu Mare, Sălaj).

b) Subjects and groups

Subjects included in the sample were 239 active athletes (112 females, 127 males) with the quality of students, graduates or having other professions, registered in different sport (sport games - 64%, of which 76 girls, 78 boys and individual sports - 36% of which 34 girls, 51 boys) in the Municipal sports club and University and 81 coaches employed at those clubs (22 females, 59 males). The average age of the subject athlete was 23 years (age range: 18-39 years) and in subject coaches, the average age is 43 years (age range: 21-64 years). The age range for subject athletes was chosen since completed secondary education for teens means a stage where "concern for vocational orientation and career choice is a dominant, especially to those who want to continue their studies" (Cosmovici et al., 1999).

c) Methods applied

In the study, the used method was to survey by administering questionnaires built for two categories of subjects - athletes and coaches. The questionnaires were developed by us, with related objectives of the proposed research, including closed questions with 2-7 choice questions, open questions featuring subjects opportunity to express their opinion and demographic questions. To

achieve this study there were used a total of 13 items in two sets of questionnaires.

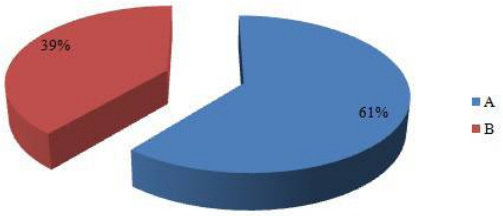
d) Statistical processing

The recorded information was processed using statistical and mathematical methods, software (SPSS – frequency distribution, χ^2 test of significance, tables Association; Excel - graphics) for quantitative data and content analysis for data quality.

Results

Results of this study, obtained by processing the recorded data are shown in Figures 1-6, respectively Tables I - IX.

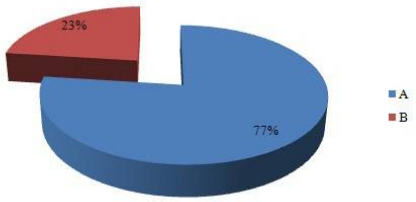
1) Is the will a known concept of dual career? (athletes)



Legend: A. Yes; B. Not

Fig. 1 – Knowing the concept of dual career – athletes

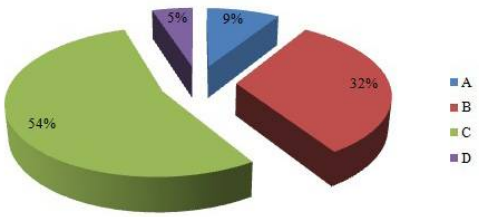
2) Is the will a known concept of dual career? (coaches)



Legend: A. Yes; B. Not

Fig. 2 – Knowing the concept of dual career – coaches

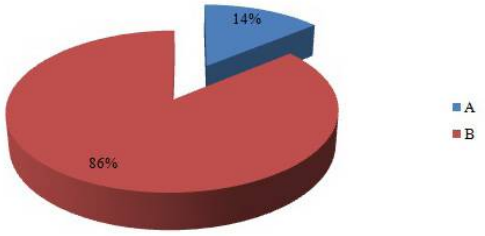
3) Starting with that moment of sporting activity do you consider that it would be appropriate to intervene in the support of the dual career development? (coaches)



Legend: A. At children level; B. At junior level; C. During transition from juniors to seniors; D. During the termination of sports career

Fig. 3 – Assessing the appropriateness of intervention for developing dual career

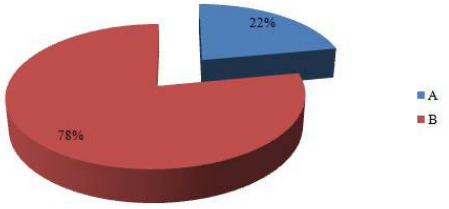
4) Do you consider that in Romania there is a legal framework to favourise the development of athletes' dual career? (coaches)



Legend: A. Yes; B. Not

Fig. 4 – Coaches' opinion on legislative component in developing dual career

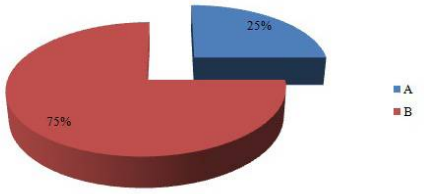
5) Do you consider you are ready for a possible withdrawal from your sport career? (athletes)



Legend: A. Yes; B. Not

Fig. 5 – Preparation stage in the event of the withdrawal from the sporting career – athletes

6) Do you believe that the athletes in our country are ready for the socio-professional integration after withdrawal from the sport activity? (coaches)



Legend: A. Yes; B. Not

Fig. 6 - Preparation stage in the event of the withdrawal from the sporting career – coaches

7) Do you know any way or legislation for supporting career development of athletes in sports and education / training? If yes, list (Table I).

Table I

Legislative regulations to support dual career known by athletes

Legislative regulations	%
Non-responses	79%
Do not know	16%
Mention some of the regulations to support dual career in sport	5%

8) Are you employed in an occupation in parallel with sport? (Table II)

9) Do you think you are prepared for an eventual withdrawal from sports career? (athletes) (Table II)

Table II
Withdrawal of presumptive sports career.

Athletes genre/Item			Are you employed in an occupation in parallel with sport? (%)		χ2	p
M	Do you think you are prepared for an eventual withdrawal from sports career?(%)	Answer	Yes	No		
		yes	41,2	15,5	6.35	0,012
		no	58,8	84,5		
N		yes	71,4	18,4	18.39	0,000
		no	28,6	81,6		

Legend: A. Yes; B. Not

10) In your opinion who should be responsible for preparing the athletes on socio-professional integration after the withdrawal from his/her sports career, so the transition should be a smooth one? (Table III, Table IV a, Table IV b, Table IV c).

Table III
Social agents involved in training the sports people in what the socio-professional integration is concerned.

Social agents	Coaches	Sports people
Sport person	54%	57%
Coach	52%	16%
Family	40%	7%
Sports club	35%	30%
Educational institutions	30%	17%
Local public institutions	30%	10%
Sport federation	27%	25%

Legend: A. Athlete; B. Coach; C. Sports Club; D. Sports Federation; E. Education institutions; F. Local institutions; G. Family

Table IV a
Agents responsible for socio-professional integration of athletes

Gender	In your opinion, who should be responsible for preparing the athletes on socio-professional integration after the withdrawal of his sports career, so the transition should be a smooth one?							
	Athlete				Coaches			
	Yes	No	χ2	p	Yes	No	χ2	p
Male	48.9%	51.1%	5,48	0,019	10.4%	89.6%	6,41	0,011
Female	63.7%	36.3%			22.1%	77.9%		

Table IV b
Agents responsible for socio-professional integration of athletes

Gender	In your opinion who should be responsible for preparing the athletes on socio-professional integration after the withdrawal of his sports career, so the transition should be a smooth one?							
	Sports club				Sports federation			
	Yes	No	χ2	p	Yes	No	χ2	p
Male	35.6%	64.4%	4,62	0,032	25.2%	74.8%	0,15	0,690
Female	23.0%	77.0%			23.0%	77.0%		

11) What activities have you undertaken for life after sports career? (athletes) (Table V).

Table V
Activities taken in preparation for careers.

Activities	%
I do not know yet what I will do/I have not thought about life after sport career / no activity	71%
University studies	20%
Part-time or temporary work	5%
Qualification courses	4%

12) What are the main factors in achieving the support for the dual career in sport? (Table VI).

Table VI
Main support factors to develop dual careers.

Support factors	%
Coach	78%
Family	69%
Sports club	54%
Educational institutions	28%
Sports federation	27%
Group of friends	12%

Legend: A. Family; B. Coach; C. Sports Club; D. Sports Federation; E. Educational institutions; F. Group of friends

13) When you are before a very important moment in life, who do you see to make the final decision? (athletes) (Table VII, Table VIII).

Tabel VIII
Support environments in decisive situations.

Support environments	%
Family related (family)	91%
Sportive (coach)	18%
Social (group of friends)	14%
Organizational (sports club)	1%

Legend: A. Family; Coach B; C. Sports Club; D. Group of Friends

14) Who should be responsible for preparing the athletes' transition from sports life to work, so that socio-professional integration would be a smooth one? (Table IX).

Table IX
Factors responsible for preparing the transition from sports to professional careers.

Responsible factors	%
Athlete	57%
Sports club	30%
Sports federation	25%
Educational institutions	17%
Coach	16%
Local public institutions	10%
Family	7%

Legend: A. Athlete; B. Family; C. Coach; D. Sports Club; E. Sports Federation; F. education institutions; G. local public institutions

Table IV c
Agents responsible for socio-professional integration of athletes

Gender	In your opinion who should be responsible for preparing the athletes on socio-professional integration after the withdrawal of his sports career, so the transition should be a smooth one?											
	Educational institutions				Local public institutions				Family			
	Yes	No	χ2	p	Yes	No	χ2	p	Yes	No	χ2	p
Male	20.7%	79.3%	2,39	0,112	9.6%	90.4%	0,04	0,833	5.9%	94.1%	0,40	0,527
Female	13.3%	86.7%			8.8%	91.2%			8.0%	92.0%		

Tabel VII
Support environments in decisive situations by gender.

Gender	When you are in front of an important moment in life, who do you see to take the right decision?											
	Family				Coaches				Friends			
	Yes	No	χ2	p	Yes	No	χ2	p	Yes	No	χ2	p
Male	92.1%	7.9%	0,43	0,512	17.3%	82.7%	0,10	0,751	15.7%	84.3%	0,30	0,580
Female	90.2%	9.8%			18.8%	81.2%			12.5%	87.5%		

15) What are the main problems you face in managing dual career? (open question).

Discussions

The concept of "dual career" as understood by the subjects included in the study, is perceived differently by coaches and athletes. For 61% of athletes (Fig. 1) the concept of "dual career" in sports is not known, but the attributed definitions reveal that is not fully understood. There was a variety of responses from some seemingly unrelated to reality, suggesting what athletes live *sports career first*, *double registration* to other complexly addressed definition: *the ability to manage your time, resources and to discipline yourself in order to obtain the highest possible performance both on sports and on schools or professional.* Most subjects (75% of all responses) downsize the concept of dual career to *sporting and another profession, occupation or combining sport with school education*, but the big goal remains *to touch performance in the sport and do not neglect school, to be a very good sport person and a very good student*. There is a category of subjects who say they are familiar with what dual career in sports means without making a mention of any other (30%).

The opinions of the coaches describe the image which requires dual career in professional sports in Romania - "combining sports activities with training in parallel, but in the background of a future, a career professional", but what would be desirable to represent a dual career - "*high performance sports career alongside training and planning what athletes will do after retirement from sport*". Not all coaches have chosen to express their views on the definition of dual career in the sport, and in the category of coaches who claim to understand this phenomenon, 77% (Fig. 2) see the concept as *two activities at the same time, sport and school, sport and occupations* with different shades of definition, highlighting that *it is almost impossible to do dual career in Romania, it is very difficult to achieve this, school, job and performance in our sport ... in our country, sports activity affects school or work and vice versa*, and 23% (Fig. 2) are not aware of that notion. Analyzing the Fig. 1 and Fig. 2 there can be seen that a greater extent, coaches know the concept of "dual career", but the difference between the two subjects is significant statistically ($\chi^2 = 8.03$; $p = 0.005$).

Concern for dual career development (sport / education) should not be a challenge to face at the end of the athletes' sporting career. The answers on the timing appreciation to intervene in support dual career reveals the majority opinion of respondents on term development, planning educational activities alongside the sports. Thus, 54% of coaches argue that the opportune moment for the intervention support is during the transition from stage juniors to the seniors, in which the student has reinforced the desire for performance and preference sports, 32% appreciate the importance of this action at the junior level 9% during initiation in sports and 5% at the end of sport career (Fig. 3). Given that at the time of transition from juniors to seniors (by branch of sports) athletes are high school graduates (or on the verge of graduation), we consider it a late stage in the planning of dual career. In this context, the question arises whether this category of coaches really support the development of both activities ? Orientation coaches seem obvious to the detriment of school sports performance.

Romania regulations do not constitute an enabling framework for the development of sports career along with educational and vocational training, as 86% of coaches (Fig. 4) who expressed an opinion concerning the legal structure claim. Coaches' dissatisfaction at the situation in sport derives not only from legal boundaries, but in the absence of information (and sometimes due to carelessness), financial and infrastructure problems. Legislative provisions supporting the career development of sports and education / training are less or not at all known by athletes. Neither is the information presented nor treated as a means to support young people in sports and professional training. For 79% of subjects athletes there were registered non- responses, 16% admit they do not know these elements and only 5% of subjects refer to regulations such as exemptions for frequency classes according to the level of performance evolving, open sessions or extended for the university exams, special session of the baccalaureate exam, financial support in the form of sports allowance, exemption from tuition, annuity, educational and cultural experience within Erasmus (Table I).

According to the subjects, sport performance advertise well organized activities under a *tight schedule, sports and school, sports and work*, due to which there installs *fatigue caused by exercise intensity with very short durations of rest, training, hours college with overlapping of the two activities* supported by *the attitude of teachers who do not understand the sport performance.* Stress generated by the classification standards in certain specific sports, athletes are brought before mental vulnerabilities *mentally succumbing in the absence of specialists*. Domain specialists point out that in the future, world widely, *the origin of the differences between high performance athletes will be psychological rather than physiological* (***, 2000). At clubs (say athletes) very few psychologists are involved (9%), their focus being oriented on aspects of physical, technical and tactical training. Sports training responsibility, although complex, is for the coaches and the tutors of the athletes.

According to the answers to item 15, time management of an athlete is influenced by a number of school, sports, family, social factors, and the requirements of each role make it difficult (or impossible) for the time management which is necessary to perform the tasks. Almost all subjects (90%) blame the problem of insufficient time, *it is generally not enough time for both activities (sports and school) personal sacrifices, family problems, prejudices and of other*. This *time constraint puts athletes in a perpetual state of tension* (Burlot et al., 2016) looking for adaptation strategies under an accelerated pace of life.

Coaches answers to the same item reveals the legislative framework insufficiently adapted to the needs of performance, lack of means of *supporting athletes from the federations, the Olympic Committee, poor information* demobilized coaches' persistence to solve problems athletes are concerned with and to keep sport at a certain level of performance, convinced, moreover, that *improving career development leave holes in the other*. If

26% of coaches have preferred not to refer to problematic situations in sports, it does not mean they do not exist. The list of issues is one vast, from financing to the ensuring poor training conditions, covering both financial resources for infrastructure development costs and expenditures to ensure support in developing athletes (medical, psychological, rehabilitation, nutrition etc.).

Injuries occurred due to accumulated fatigue, intensive training without adequate restoring, the absence of specialists to prevent and intervene in critical situations, the attitude of teachers who *do not agree with sports career*, are all stress factors for athletes who reach the threshold of sports abandonment. The relationship with the school as supporting subjects, is *difficult*, *teachers agree only school activity*; educational requirements *adversely affect the program of sports training* because they devote more time to school activities detrimental to the sport. In this context, it is important to correlate school and academic activities with sport ones to avoid overlaps between these two activities. Encouraged to attend courses in higher education, the athletes get diplomas in various fields *without the faintest idea of specialization chosen*", their attention is required more for sport.

Such a phenomenon is emerging athletes with academic degrees, limited theoretical knowledge (in some cases) in accordance with practical skills. The problem for athletes to find jobs at the time of withdrawal from sports career is highlighted by the coaches, it is part of the abandonment decisions in sports, met during high school graduation, when students face the future challenges of life. For athletes sometimes it is "*difficult to balance the challenges and constraints of the educational system and the labor market*" (1).

Career in sport has a fixed term, it is important that athletes, coaches and those involved in this phenomenon to pay attention to the preparedness phase of the transition from the world of sport in the labor market, given that *youth and sports are seen increasingly as a resource to help achieve organizational objectives of the latter* (Berit et al., 2016). Withdrawal from competition is an inevitable part of sports career for any person engaged in an activity performance sporting stage which may be accompanied by difficulty at the *level of employment such as lack of professional careers, lack of professional qualifications, less appropriate professional career choice and a decrease in financial income* (Cecic Erpic, 1998, Wylleman et al., 1993, Werthner & Orlic, 1986 cited by Hatamleh, 2013), loss of sport identity and self-esteem (McKnitght et al., 2009).

Preparing for socio-professional integration should occupy a priority place in the training of young people. We find out that 78% of athletes (Fig. 5), and 75% of coaches (Fig. 6) in Romania consider that athletes do not have adequate training so as to achieve a smooth transition. Socio-professional integration depends on individual ability to assimilate cultural norms, investment in education and training to secure the future of the young (***, 2014). For the most part, regardless of gender, athletes believe that they are not prepared for retirement from sports career, however, female athletes declare a higher proportion prepared for this stage compared to male athletes, the difference being statistically significant (Table II). From Table Association (Table II) can see that male athletes, whether or not engaged in an occupation in parallel with sport in bulk are not prepared for a possible withdrawal in their sports career. However, the difference between those employed in occupations alongside the sport compared to those not involved is statistically significant ($\chi^2 = 6.35$, $p = 0.012 < 0.05$), those not enrolled in a professional activity in parallel with sport it is considered a rate significantly higher the ones which are unprepared for a possible withdrawal of their sports career. The situation is slightly different for female athletes (Table II), athletes who are employed in an occupation alongside the sport are considered the most prepared for a possible withdrawal of their sports career, compared to athletes who are not involved in parallel in a professional activity and thus not considered ready for a retirement from sports career (statistically significant differences between athletes involved in a professional activity compared to the uninvolved, $\chi^2 = 18.39$, $p = 0.000 < 0.05$).

According to the subjects, responsibility for preparing athletes on socio-professional integration after the withdrawal of his sports career, so the transition should be a smooth one, it is for the athletes and coaches, as evidenced by the structure of the answers given by coaches and athletes (Table III). The role of education, of the teacher is the most important achievement *product of society: man trained and integrated into professional and social structures* (Voinea & Apostu, 2008) as appreciated by 30% of subjects (coaches - Table III).

Most sports athlete deemed to be responsible for preparing for socio-professional integration after the withdrawal of their sports career, compared to athletes (statistically significant difference, $p = 0.019 < 0.05$) (Table IV.a). Also, there were statistically significant differences with respect to liability and coaching in preparing socio-professional integration of the athlete after retirement ($p = 0.011 < 0.05$) - responsible athletes consider a greater extent on the coach as compared to athletes, even though both categories are generally not expected to be accountable to the fullest extent (Table IV a). But, on the same item, athletes consider the club responsible for preparing for integration after retirement ($p = 0.032 < 0.05$) (Table IV b). Sports federation should not be responsible for the integration of athletes after retirement according to most respondents, regardless of gender (Table IV b). Also, athletes are not expected to be responsible for their socio-professional integration after the withdrawal of educational institutions, local government or family, regardless of gender (the differences are not statistically significant, $p > 0.05$ – (Table IV c).

Focused mainly on sport, directed or not by the coaches in this direction, 71% of athletes had no intention of relating the relinquishment sports career, being at an age when they can perform successfully in sport (media the age of the subjects is 23 years), either do not know what to do or have not *thought still life after retirement from sport, I do not know what to do in this direction* (Table V). This approach of accumulation and sport development will give troubles at the end of their career, as shown in some studies, and the chances that athletes might be prepared for integration

into the labor market are much smaller as they devote more time to sports training and work competition (Heinemann, 1998 cited by López de Subijana et al., 2015).

As called for by the European Council in 2008 (***, 2011) dual career development training approach should also aim at providing a quality education alongside sports training, but subjects assigned this responsibility in educational establishments at the rate of 28% (Table VI). Professional paths of an adult may be considered a consequence of earlier decisions, youthful decisions influenced by social environment, family, school or group of friends. The family, as an environment for the athletes' decision-making in situations in life, has the most significant influence on the formation of values in children and teenagers. Regardless of gender ($p > 0.05$ in all cases), athletes should consult when facing a difficult time in life with family, friends and coach respectively, in a much smaller proportion (Tabel VII). The coach who organizes and leads the training athletes is involved in their life having a dual role, instructor and educator, appreciated by 18% of athletes (Table VIII). Friends can influence the attitude of life, school performance or sports (14%), but in the important moments of life, subjects related to family (91%) (Table VIII).

Career development oriented towards an upward path requires a high degree of commitment assumed by 57% of athletes on the responsibility to prepare the transition from sports life to a professional career, but also the involvement of sports facilities - sports club - 30% and sports federation - 25 % (Table IX). The accelerated pace of change in modern society has an effect on the population not only positive in nature. Preparing athletes to adapt to the changing labor market is a difficult one, given that it is not followed immediately upon graduation (in most cases) and professional framing. Distance between the two stages, lack of internships, increases the distrust of athletes in the applied professional skills and the employers.

Athletes that get in front of the employer are facing its skepticism towards the professional skills of former athletes. Prejudices like *do not know anything except sport* undo a potential candidate that comes from sport with a set of unique abilities, involved in sport, compared to an average candidate, although holding that such skills are not developed. A candidate from rural sport comes with extra baggage that could be an advantage for employers precisely for the set of values and skills that can be harnessed to work. Studies reveal the existence of a close relationship between sport and the development of certain areas of professional activity, areas that experienced social attitudes and skills in the sport can be exploited (Wylleman & Lavallée, 2004 cited by Debois et al., 2015) .

Conclusions

Analyzing the recorded data, there resulted a series of relevant aspects of dual career in sports management, conclusions that may constitute new lines of research:

1. Although the meaning of the concept of "dual career in sport" is known to coaches and athletes in statements, in reality, the attrib uted definitions show that the phenomenon is not well understood; also supporting legislative provisions in the development of sport and education are little or unknown.

2. The opinions of the coaches converge to establish a timing debut as dual career planning during the transition from junior to senior athletes, supported by a legal framework favoring the development of sports and school / academic performance.

3. Problems involved in managing dual career are: financial; of cooperation between units of sports and education; of infrastructure; in the sphere of sports training with physical and mental strain; temporal in their tasks for athletic and school performance, with athletes faced with career choices

4. Selection of professional and/or sports route (as stated by athletes), is a responsibility assumed by athletes, supported by family, encouraged by coaches and the expectations of providing professional integration are assigned to sports facilities (clubs, federations, coaches) and the educational entities are directly involved in the training and development of athletes.

5. Integration into the labor market remains a problem when the athletes' sporting career comes to an end, facing skepticism at employers towards the professional skills of former athletes.

Conflict of interests

There is no conflict of interest regarding the methodology of the study and its results.

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References

Ābeļkalns I, Geske A. High Performance Athletes Dual Career Possibilities in Latvian Higher Educational Institutions. Lase J Sport Sci 2013;4(2):47-60.

Berit S, Milena P, Barrie H. Young people and sport: from participation to the Olympics - introduction to the special issue. Sport in Society: Cultures, Commerce, Media, Politics. The online platform for Taylor & Francis Group content. Available online from http://www.tandfonline.com/doi/abs/10.1080/17430437.2015.1124560. Accessed on 09.07.2016.

Burlot F, Richard R, Joncheray H. The life of high-level athletes: The challenge of high performance against the time constraint. Int Rev Soc Sport. doi: 10.1177/1012690216647196/.

Corrado L, Tessitore A, Capranica L, Rauter S, Topic MD. Motivation for a Dual-Career: Italian and Slovenian Studentathletes. Kinesiologia Slovenica. 2012;18 (3):47:56.

Cosmovici A, Iacob L (coord.). Psihologie şcolară. Ed. Polirom Iaşi. 1999, 50.

Debois, N, Ledon A, Wylleman P. A lifespan perspective on the dual career of elite male athletes. Psychol Sport Exerc. 2015;21:15-26.

Geraniosova KAD, Ronkainen N. The Experience of Dual Career through Slovak Athletes Eyes. Phys Cult Sport. Studies and Research. DOI: 10.1515/pcssr -2015-0005.

Guidotti F, Cortis C, Capranica L. Dual Career of European Student athletes: A Systematic Literature Review. Kinesiologia Slovenica, 2015;21 (3):5-20.

Hatamleh MR. The Life Transitions of High Performance Athletes Retirement from Sport. Eur Sci J. 2013;9(11):336-353.

López de Subijana C, Barriopedro IM, Sanz I. Dual career motivation and athletic identity on elite athletes. Rev Psicol del Deporte. 2015;24(Suppl 1):55-57.

McKnight K, Bernes K, Gunn T, Chorney D, Orr D, Bardick A. Life After Sport: Athletic Career Transition and Transferable Skills. J Excellence 2009;13:63-77.

Rowles KS. An Investigation into Factors that Contribute to the Perception of Disparities between Academic Achievement and Athletic Participation in High School Student-Athletes. The Sport Journal, 2015. Available online from http://thesportjournal.org/article/an-investigation-into-factors-that-contribute-to-the-perception-of-disparities-between-academic-achievement-and-athletic-participation-in-high-school-student-athletes. Accessed on 07.02.2016

Stambulova N. Counseling Athletes in Career Transitions: The Five-Step Career Planning Strategy. J Sport Psychol Action. 2010;1(2):95-105. DOI: 10.1080/21520704.2010.528829.

Voinea M, Apostu I. Familia şi şcoala în impas? Valori şi modele de socializare în tranziţie. Ed. Univ. Bucureşti, 2008, 131.

***. Carta drepturilor fundamentale a Uniunii Europene, versiune consolidată a Tratatului privind Uniunea Europeană şi a Tratatului privind funcţionarea Uniunii Europene. Comisia Europeană.Oficiul de Publicaţii al UE. Luxenburg, 2010.

***. Cartea albă a sportului. Luxemburg: Oficiul pentru Publicaţii Oficiale ale Comunităţilor Europene, 2007,6.

***. Comunicarea Comisiei către Parlamentul European, Consiliu, Comitetul Economic şi Social

European şi Comitetul Regiunilor. Dezvoltarea dimensiunii Europene a Sportului. Comisia Europeană. Direcția Generală Comunicare. Bruxelles, 2011. Available online from

http://eur-lex.europa.eu/legal-content/RO/TXT/PDF/?uri=CELEX:52011DC0012&from=RO/

Accessed on 29.01.2015.

***. Metodologia antrenamentului. Ed. CCPSport Bucureşti. Col. SDP, 2000;419-422,280.

***. Să înţelegem politicile Uniunii Europene: Educaţie, formare, tineret şi sport. Comisia Europeană. Direcția Generală Comunicare. Bruxelles, 2014.

***. Study on the Minimum Quality Requirements for Dual Career Services. Ed. European Commission-Sport, Luxembourg: Publications Office of the European Union, 2016. doi: 10.2766/567357. Available online from http://www.sportknowhowxl.nl/files/2016/DualCareer.pdf/ Accessed on 03.10.2016.

Websites

(1) http://www.eu2015lu.eu/en/actualites/articles-actualite/2015/11/20-conf-carriere-double-sportifs/index.html/Romain S. Conference on Dual Careers of Athletes. 20 Nov. 2015 in Munsbach, 2015, Par. 2. Accessed on 08.07.2016

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Modeling physical training in young basketball players
Modelarea antrenamentului în pregătirea fizică a tinerilor baschetbalişti

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Abstract

Background. The importance of physical training in general and the level of explosive strength of the lower limbs in particular is a priority in achieving juvenile level sports performance.

Aims. This research aims to monitor the level of explosive power of the *Under 13* (U13) and *Under 14* (U14) teams using four tests measured with an Optojump Next System device.

Methods. Two tests to assess anaerobic alactacid power (Jumps 15/30 sec. test), a test to assess muscle strength and muscle fibre recruitment levels (Squat Jump test), and the Stiffness test to assess the level of reactive force and muscle elasticity were performed.

Results. After applying the tests, weaknesses or strengths of a team against the other team were found, and then, a plan for training and optimization adapted to increase the explosive force of the U13 team was developed. After implementing a physical training program adapted to the U13 team, the same tests were repeated. The data obtained validated the effectiveness of the proposed program.

Conclusions. After applying a power optimization program for the lower limbs to the experimental group, we observed an improvement of specific power in both anaerobic power tests and the Squat Jump test (SJ). The improvement was significant in the assessment of muscle elasticity (Stiffness test).

Key words: explosive force, power, Optojump Next System, lower limb, young basketball players.

Rezumat

Premize. Importanţa pregătirii fizice în general şi a nivelului forţei explozive la nivelul membrelor inferioare în special este prioritară în atingerea performanţei sportive la nivel juvenil.

Obiective. Cercetarea de faţă îşi propune monitorizarea nivelului forţei explozive la echipele *Sub 13 ani* (U13) şi *Sub 14 ani* (U14), cu ajutorul a patru teste măsurabile cu dispozitivul Optojump Next System.

Metode. Testul de 15 sec. sărituri succesive şi testul de 30 sec. sărituri succesive au fost alese pentru a monitoriza puterea anaerobă alactacidă, testul SJ (Squat Jump) a fost ales pentru a monitoriza forţa explozivă şi nivelul de racolare a fibrelor rapide, iar testul Stiffness a fost ales pentru a monitoriza nivelul forţei reactive şi al elasticităţii musculare.

Rezultate. În urma aplicării testelor s-au constatat deficienţele sau plusurile unei echipe faţă de cealaltă echipă, iar apoi s-a elaborat un plan de pregătire şi optimizare adaptat nevoilor de creştere a nivelului forţei explozive a echipei U13. După implementarea programului de pregătire fizică adaptat asupra echipei U13, au fost efectuate încă o dată aceleaşi teste. Datele obţinute demonstrează eficacitatea programului propus.

Concluzii. După aplicarea programului de optimizare a puterii la nivelul membrelor inferioare la grupa experimentală s-a observat o îmbunătăţire a puterii specifice în cele două teste care monitorizează puterea anaerob alactacidă precum şi la testul Squat Jump (SJ). Îmbunătăţirea este semnificativă la testul de evaluare a elasticităţii musculare.

Cuvinte cheie: forţă explozivă, putere, Optojump, membre inferioare, baschet.

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Introduction

Athletic performance, as a result of preparation, is achieved by manipulation methods that induce the body's adaptation to increasingly higher efforts (Bompa, 2003). Physical preparation should be in the service of technical training (Cometti, 2003). An important feature of training in sport performance is maximizing the importance and role of physical preparation in practice (Teodorescu, 1975). Consequently, the specialist, without neglecting the other aspects of training (technical and tactical, psychological, theoretical), should allocate an appropriate percentage of time to training the physical condition of the players, using a methodology of training with footholds in realities and development trends of the modern game and in the current guidelines for the training of basketball players and teams (Feflea, 2013). Physiological characteristics of the efforts required by specific actions of the basketball game are the result of the relationship between the characteristics of efforts and the energy potential of the athletes' body (Feflea, 2013). Strength training has become increasingly popular among coaches. If until recently strength training was specific only to athletes, it is now an important component in most sports for both injury prevention and recovery (Wernbom et al., 2007).

New trends in the basketball game highlight the need for a very good physical preparation of the players. Juvenile basketball is characterized by dynamism. Basketball requires strength, speed, agility and power (Siegler et al., 2003).

There are numerous studies that have explored the physical quality of basketball players and young adults (Ostoji et al., 2006; Ziv & Lidor, 2009; Torres-Unda et al., 2013).

Physical training can compensate, at one point, technical training. An inadequate physical preparation can affect the technical components of the game (free throws, assists, passing from attack to defense, defense itself). Physical performance is measured by the amount of acquired skills and motor abilities. It has been found that the most successful teams are those that possess the most explosive capabilities (Hoffman & Maresh, 2000; Hoffman et al., 1996).

At junior level, training models generally focus on increasing resistance, but not enough attention is paid to high intensity training (Sampaio et al., 2004; Siegler et al., 2003).

Running speed and explosive force develop after 13 years of age, and strength and other motor skills significantly improve after mid-childhood (Malina et al., 2004).

The combination of power, strength and coordination is carefully monitored and coached in all sports. A similar study was done by Castagna et al., (2009), which assesses aerobic capacity and the explosive power of the lower limbs in amateur basketball players in Italy.

Objectives

The importance of physical preparation in general and the level of explosive force of the lower limbs in particular is a priority in achieving juvenile level sports performance. The research aims to monitor the level of explosive force in basketball players under 13 years old (U13) and under 14 years old (U14).

Hypothesis

Plyometric exercises contribute to improving the explosive strength of the lower limbs. In this work we aimed to analyze the explosive force level of U13 and U14 basketball players, and to propose a training program with exercises specific to the basketball game that helps to improve the explosive strength and motor memory of players.

Material and methods

Research protocol

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 Faculty of Physical Education and Sport concerning investigation on human subjects, and that we obtained the written consent of the subjects and their parents.

a) Period and place of the research

The research was conducted in Târgu Mureş, from September to June 2013.

b) Subjects and groups

The research group consisted of 22 male subjects, aged between 13-14 years, members of the Basketball Club Mures team (BCM - 11 subjects) and „Szasz Adalbert" Sports High School (LPS - 11 subjects) in Tg. Mures, participants in the National Basketball Championship, U13 and U14 categories. The subjects of the LPS team were the experimental group (E) and the subjects of the BCM team, the control group (C).

In the experimental group, a training program addressing the weaknesses identified (recruitment of fast muscle fibers and muscle elasticity) was proposed and implemented by using exercises that mimic specific movements from the game of basketball, because using them will also improve motor memory.

The program contains the following exercises performed in series and repeated 4 times (Table I):

Table I

Program to optimize the power of legs.

Technical description	Dosage
Ex.1 Semigenuflexion followed by vertical jump, hands rest on espaliers	10 repetitions - 4 series
Ex.2 Jumping on two feet, moving forward	10 repetitions - 4 series
Ex.3 Jumping over fences on two feet (10 fences - 40 cm high)	10 repetitions - 4 series
Ex.4 On the gym bench, successive jumps changing legs	10 repetitions - 4 series
Ex.5 Jumping on the gym bench (20 cm high) with legs stretched	10 repetitions - 4 series
Ex.6 Successive jumping on one foot, moving forward	10 repetitions right - 4 series 10 repetitions left- 4 series

In the LPS team (E), the program for optimizing leg power was applied 2 times a week.

In the BCM team (C), no program was applied, the players continued the specific preparation without the

introduction of a separate physical training workout.

c) Tests applied

For evaluating the explosive strength of the lower limbs of young basketball players, we selected 4 tests from the Bosco Protocol, measurable with the Optojump Next System device:

1. Repetitive jumps 15 sec (RJ 15 sec.) – which assess anaerobic alactacid power. This test involves performing successive jumping on the spot by bending and extending the knees. The aim is to achieve the greatest number of jumps with the highest detachment for 15 sec. The height of the jump is automatically calculated by the device software by determining the time of flight (Tf) and the time of contact (Tc) (Bosco et al., 1983).

2. Repetitive jumps 30 sec (RJ 30 sec.) – which assess anaerobic alactacid power. During this test, the athlete performs a great number of successive jumps by bending and stretching the knees for 30 seconds. The height of the jump is automatically calculated by the device software by determining the time of flight (Tf) and the time of contact (Tc) (Bosco et al., 1983).

3. Squat jump test (SJ) – to assess muscle strength and the level of recruitment of fibers. The test is performed from sitting position with knees bent at 90 degrees, hands on hips. From this position, the subject jumps vertically without moving the arms. After each jump, the subject must reach its original position.

4. Stiffness test (ST) - to assess muscle elasticity, which consists of performing five successive jumps and recording the time of flight (Tf) and the time of contact (Tc). The best ratio between the two parameters is considered as representative of the explosive power of the lower limbs (Bosco et al., 1983).

All tests used in this study are specific for assessing the explosive power of the lower limbs. Data collection was performed by the same evaluator in all tests and for all moments of evaluation in this study. The tests were always applied during the usual training program of the studied team (experimental group) and were preceded by a standardized warm-up.

Specific power (W/kg) is calculated using the formula (1):

$$Specific\ power = \frac{g^2 \times \sum T_f (\sum T_f + \sum T_c)}{4 \times nr.jumps \times \sum T_c} \quad (1)$$

where g = gravitational force,

$\sum T_f$ = sum of values of the time of flight (Tf) for every jump of the test (s)

$\sum T_c$ = sum of values of the time of contact for every jump of the test applied (s)

no. jumps = number of jumps performed during the test

d) Statistical processing

For statistical calculation, we used SPSS 20.0 for Windows, and the data were represented as mean and standard deviation, based on which parametric t tests comparing the averages were applied. The t test for independent samples was applied to check whether there were significant differences between the groups.

With the Optojump device software, the best and worst value, the mean and standard deviation for all parameters were calculated. For the analysis of data of each player, the t-test for independent variables was applied (Bosco et al., 1983).

Results

The results are presented in (Tables II-VIII, Figs. 1, 2).

Table II

Scoring scale, after (1).

Power average (w/kg)	Poor 1	Mediocre 2	Medium 3	Good 4	Excellent 5
15 sec. jump test (power)	< 25.0	25.1-28.3	28.4-31.6	31.7-34.9	> 35.0
30 sec. jump test (power)	<20.0	20.1-23.3	23.4-26.6	26.7-29.9	>30
Squat jump test (cm)	< 32	32-37	38-42	43-47	> 47
Stiffness	<36	36-39	40-46	47-54	>55

Table III

The result for the control group at the initial and final testing.

Tests		Characteristics	Initial testing				Final testing			
			∑	Average	Min	Max	∑	Average	Min	Max
15 sec. Repetitive jump test	T1	Specific power (w/kg)	260.14	23.65	18.60	33.14	270.99	24.64	19.30	35.33
		Average power (w/kg)	268.98	24.45	20	38.16	282.82	25.71	20.33	39.71
30 sec. Repetitive jump test	T2	Specific power (w/kg)	243.91	22.17	18.25	28.11	253.26	23.02	18.44	29.56
		Average power (w/kg)	244.76	22.25	18.02	30.03	254.45	23.21	16.42	32.30
SJ test	T3	h(cm)	438.9	39.9	34.6	45.5	446.60	40.60	35.00	47.10
STIFFNESS test	T4	Specific power (w/kg)	309	28.09	20.46	35.63	317.08	28.82	21.32	37.33
		Average power (w/kg)	360.99	32.82	22.25	42.91	269.71	33.62	24.31	42.30

Table IV

The result for the experimental group at the initial and final testing

Tests		Characteristics	Initial testing				Final testing			
			∑	Average	Min	Max	∑	Average	Min	Max
15 sec. Repetitive jump test	T1	Specific power (w/kg)	237.83	21.62	14.11	28.66	237.75	21.61	15.66	28.72
		Average power (w/kg)	237.59	21.60	14.87	27.52	238.05	21.65	14.98	27.33
30 sec. Repetitive jump test	T2	Specific power (w/kg)	222.27	21.60	14.87	27.52	222.53	20.23	14.74	25.71
		Average power (w/kg)	224.81	20.44	15.3	26.69	223.07	20.27	15.67	26.77
SJ test	T3	h(cm)	434.7	39.52	26.08	50.2	388.7	38.87	23.3	51
STIFFNESS test	T4	Specific power (w/kg)	328.80	29.89	21.46	38.46	328.89	30.26	22.97	38.99
		Average power (w/kg)	382.69	34.79	24.07	47.03	381.78	34.70	24.17	48.15

Table V
T test for paired samples - control group

Pairs	Control group	Mean	Std. deviation	Sig. (2-tailed)
Pair 1	controlTIE1spPower - controlTFE1spPower	-.98555	1.32022	.033
Pair 2	controlTIE1avgPower - controlTFE1avgPower	-1.25800	1.30224	.009
Pair 3	controlTIE2spPower - controlTFE2spPower	-.85018	.97170	.016
Pair 4	controlTIE2avgPower - controlTFE2avgPower	-.88100	1.62482	.102
Pair 5	controlTIE3h - controlTFE3h	-.70000	1.32061	.109
Pair 6	controlTIE4spPower - controlTFE4spPower	-.72927	.96463	.031
Pair 7	controlTIE4avgPower - controlTFE4avgPower	-.80027	1.14917	.044

* 95% Confidence interval of the difference

Table VI
T test for paired samples – experimental group

Pairs	Experimental group	Mean	Std. deviation	Sig. (2-tailed)
Pair 8	expTIE1spPower - expTFE1spPower	.00827	.83015	.974
Pair 9	expTIE1avgPower - expTFE1avgPower	-.04200	1.10962	.903
Pair 10	expTIE2spPower - expTFE2spPower	-.02300	.77678	.924
Pair 11	expTIE2avgPower - expTFE2avgPower	.15818	.36441	.181
Pair 12	expTIE3h - expTFE3h	.70909	1.74095	.207
Pair 13	expTIE4spPower - expTFE4spPower	-.37227	.63926	.082
Pair 14	expTIE4avgPower - expTFE4avgPower	.08273	1.60578	.868

* 95% Confidence interval of the difference

Table VII
Final result for the LPS team – E group

Name of player	T1 15 sec. Repetitive Jump test		T2 30 sec. Repetitive Jump test		T3 SJ test	T4 STIFFNESS test	
	Specific power (w/kg)	Avg. power (w/kg)	Specific power (w/kg)	Avg. power (w/kg)	H (cm)	Specific power (w/kg)	Avg. power (w/kg)
BT.	18.606	20	18.255	18.02	37.4	20.465	22.25
CŞ	23.52	25.04	22.097	22.17	37.2	27.229	38.38
PL	33.142	38.26	27.804	30.03	44.6	35.639	40.03
ŞL	21.918	23.45	19.848	20.66	35.3	26.597	33.07
BB	26.491	28.42	28.112	27.68	45.5	34.303	42.91
PV	25.283	24.29	23.261	22.94	44.3	28.184	31.45
PD	22.126	21.49	20.802	20.49	34.6	23.224	27.52
MR	21.898	21.2	19.251	19.01	38.2	26.476	28.89
MI	20.736	20.06	18.608	18.46	35.2	21.556	24.83
KA	25.766	24.87	21.243	21.04	41.7	31.199	33.48
SB	20.659	21.9	24.63	24.26	44.9	34.128	38.18

Table VIII
Final result for the BCM team – C group

Name of player	T1 15 sec. Repetitive Jump test		T2 30 sec. Repetitive Jump test		T3 SJ test	T4 STIFFNESS test	
	Specific power (w/kg)	Avg. power (w/kg)	Specific power (w/kg)	Avg. power (w/kg)	H (cm)	Specific power (w/kg)	Avg. power (w/kg)
SAT	28.66	27.52	25.716	26.69	50.2	37.829	38.03
MD	21.592	20.83	19.618	19.32	35.2	28.671	28.73
HT	20.375	19.72	18.379	19.33	46.4	24.231	37.74
HA	23.316	22.57	22.067	22.88	42.8	26.333	28.44
BB	20.558	19.61	19.868	19.49	40.5	33.994	34.14
PV	22.352	21.42	20.186	19.98	35.6	21.469	31.6
PD	21.114	22.8	21.024	20.65	39.4	33.61	38.97
MR	14.113	14.87	14.789	15.3	26.8	24.047	24.07
MI	22.679	21.66	21.455	20.99	42.2	28.068	34.07
KA	22.069	23.99	21.054	20.66	37.6	38.466	47.03
SB	21.009	22.6	18.122	19.52	38	32.085	39.87

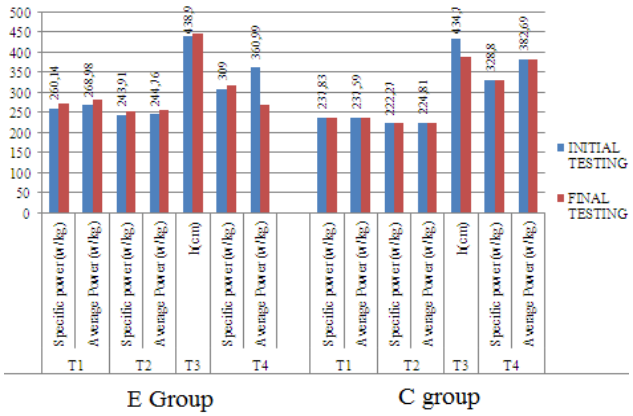

Fig. 1 – Comparative chart of statistical parameter "Σ" for both teams, at the initial and final testing.

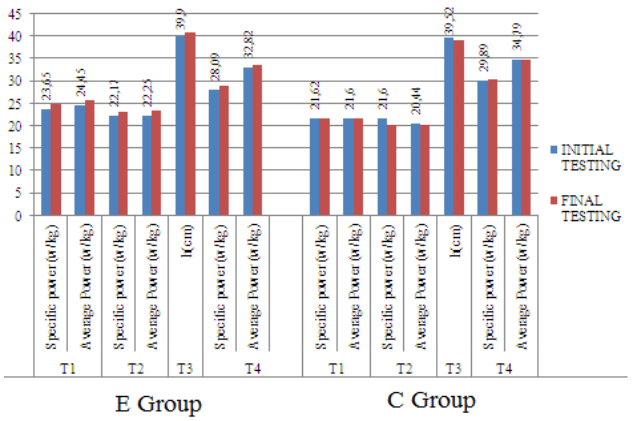

Fig. 2 – Comparative chart of statistical parameter "Average" for both teams, at the initial and final testing.

Discussions

In Table II, the scoring scale is presented, and in Tables III and IV, the results for each team are compared both at the initial testing and the final testing.

By analyzing the results of the LPS team – E group, we can see that in the first test, the best value of specific power was obtained by player no. 3 with 33.142 w/kg (Table VII) compared to 28.600 w/kg (player 1 - Table VIII). In the second test, the highest value for LPS was 28.112 w/kg (player 5 - Table VII) compared to 25.7161 w/kg (player 1 - Table VIII). For the third test, the best value was that of player 11 of BCM, 50.2 cm (Table VIII) versus 44.9 (player 1 LPS - Table VII). At the last test, the best value was 38.466 w/kg (player 1 - tableVIII) versus 35.639 w/kg (player no. 3 - Table VII).

For data analysis, we made a comparison between the two teams. We extracted specific power using formula no. 1 and average power for both teams. All comparisons are shown in Figs. 1 and 2.

In terms of tests carried out to monitor the explosive power of the lower limbs, the LPS team had a higher value in tests 1, 2, 3, and a lower value in test 4, which assesses muscle elasticity.

In the SJ test, LPS values were lower compared to the BCM team. This shows that LPS had deficiencies in fast fiber recruitment (measured by the SJ test) and low muscle elasticity (assessed by the Stiffness test).

After applying the program for optimizing leg power to the LPS team two times a week, the following were observed:

The LPS team improved specific power in the 2 tests that monitor anaerobic alactacid power. An increase in test 3 (SJ test) monitoring the recruitment of fast fibers was also found. At the last test, which assesses muscle elasticity, a significant improvement of this parameter was observed.

In the BCM team, who followed no program, specific training was continued without introducing a separate physical workout. The following aspects were observed in the final testing: the power level in the tests performed remained within the same limits, with insignificant increases and decreases. All these data were confirmed by the t-test for paired samples for each group.

Although speed is a complex skill (Moreno, 1994), a short time of contact during explosive actions can have a positive influence on speed. We believe that the implementation of a program to optimize explosive strength in the legs, performed 2 times a week, can have beneficial effects on the explosive power of the lower limbs, resulting in increased performance in the game of basketball.

Conclusions

1. The introduction of a specific physical training program contributes, in both U13 and U14 age groups, to improving the motor ability of the players and increasing motor skill indices.

2. In the case of U13 and U14 juniors, performing exercises that mimic specific movements from the basketball game will improve their motor memory.

Conflicts of interests

There were no conflicts of interests.

References

Bompa TO. Performanţa în jocurile sportive. Teoria şi metodologia antrenamentului. Ed. Ex Ponto, Bucureşti, 2003,11,66-67.

Bosco C, Luhtanen P, Komi PV. A simple method for measurement of mechanical power in jumping. Eur J Appl Physiol 1983;50(2):273-282.

Castagna C, Chaouachi A, Rampinini E, Chamari K, Impellizzeri F. Aerobic and explosive power performance of elite italian regional-level basketball players, J Strength Cond Res 2009;23(7):1982-1987.

Cometti G. La preparacion fisica en el baloncesto. Ed. Paidotribo, Barcelona, 2003,17.

Feflea I, Roşca E. Caracteristicile efortului fizic în jocul modern de baschet. Palestrica Mileniului III – Civilizaţie şi Sport 2013;14(4):308-312.

Hoffman JR, Maresh CM. Physiology of basketball. In: Exercise: Basic and Applied Science. Garrett, WE and Kirkendall, DT, eds. Baltimore, MD: Lippincott Williams & Wilkins, 2000,733-744.

Hoffman JR, Tenenbaum G, Maresh CM, Kreamer WJ. Relationship between athletic performance tests and playing time in elite college basketball players. J Strength Cond Res 1996;10(2):67-71.

Malina RM, Bouchard C, Bar-Or O. Growth, maturation, and physical activity. Champaign (IL): Human kinetics, 2004.

Moreno E. Defining and developing quickness in basketball. Part I. J Strength Cond Res 1994;16:53-54.

Ostojić S, Mazić S, Dikić N. Profiling in basketball: Physical and physiological characteristics of elite players. J Strength Cond Res, 2006;20(4):740-744.

Sampaio J, Ibáñez S, Feu S. Discriminative power of basketball game-related statistics by level of competition and sex. Percept Motor Skills 2004;99(3 Pt2):1231-1238.

Siegler J, Gaskill S, Ruby B. Changes evaluated in soccer-specific power endurance either with or without a 10-week, in-season, intermittent, high-intensity training protocol. J Strength Cond Res 2003;17(2):379-387.

Teodorescu L. Probleme de teorie şi metodică în jocurile sportive. Ed. Sport-Turism, Bucureşti, 1975,50-51.

Torres-Unda J, Zarrazquin I, Gil J, Ruiz F, Irazusta A, Kortajarena Seco J, Irazusta J. Anthropometric, physiological and maturational characteristics in selected elite and non-elite male adolescent basketball players. J Sports Sci, 2013;31(2):196-203.

Ziv G, Lidor R. Physical attributes, physiological characteristics, on-court performances and nutritional strategies of female and male basketball players. Sport Med. 2009;39:547-568.

Wernbom M, Augustsson J, Thomeé R. The Influence of frequency, Intensity, Volume and Mode of Strength Training on Whole Muscle Cross-Sectional Area in Humans. Sports Med. 2007;37(3): 225-264.

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REVIEWS
ARTICOLE DE SINTEZĂ

Exercise, osteoprotegerin and bone metabolism
Efortul fizic, osteoprotegerina și metabolismul osos

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Abstract
Osteoprotegerin (OPG) is a member of the tumor necrosis factor superfamily and acts as a decoy soluble receptor for the receptor activator of nuclear factor kB (RANK) ligand (RANKL). It thus prevents RANKL binding to its receptor RANK and the activation of osteoclastogenesis and osteoclast-induced bone loss. Physical exercise is known to have a favorable effect on bone mass. The aim of this article is to analyze the studies which evaluated the modifications of circulating OPG and RANKL in relation to different types of exercise and to bone turnover markers. The results of these studies indicate a positive effect of physical exercise on bone mass that is not accompanied by significant modifications of OPG and RANKL, in the majority of these studies. The increase of OPG levels found in long-distance runners suggests a role of OPG as a mediator of mechanical loading in humans. In conclusion, the role of OPG and RANKL in relation to physical exercise and bone metabolism is not yet clear, in view of the existing literature data.
Key words: exercise, osteoprotegerin, RANKL, bone mass.

Rezumat
Osteoprotegerina (OPG) este un membru al superfamiliei factorului de necroză tumorală şi acţionează ca un fals receptor solubil pentru RANKL - ligantul receptorului activator al factorului nuclear kB (RANK). Ea împiedică astfel legarea RANKL de receptorul său RANK şi, în consecinţă, activarea osteoclastogenezei şi a reducerii masei osoase. Exerciţiul fizic are un rol favorabil cunoscut asupra masei osoase. Scopul acestui articol a fost de a analiza studiile care au evaluat modificările nivelurilor OPG şi ale RANKL în relaţie cu diferite programe de exerciţii fizice şi cu markerii "turn-overului" osos. Rezultatele indică un efect favorabil al exerciţiului fizic asupra masei osoase, modificările concentraţiilor OPG şi RANKL fiind nesemnificative, în majoritatea cazurilor. Nivelurile crescute ale OPG constatate la alergătorii de cursă lungă (maraton) sugerează un posibil rol de mediator al OPG la nivel osos, în contextul încărcării mecanice. În concluzie, rolul OPG şi al RANKL în relaţia dintre efortul fizic şi metabolismul osos este încă neclar, în lumina datelor existente în prezent în literatură.
Cuvinte cheie: efort fizic, osteoprotegerina, RANKL, masa osoasă.

Introduction

Osteoprotegerin (OPG) is an important molecule for both bone metabolism and vascular wall pathology and it has also been involved in carcinogenesis and central thermoregulation. It has been associated with both osteoporosis and vascular atherosclerosis and calcification (Simonet et al., 1997; Caidahl et al., 2010). OPG protects against osteoporosis, inhibiting osteoclastogenesis (Simonet et al., 1997; Schoppet et al., 2002). The precise role of OPG at the level of the arterial wall is still a subject of debate, because animal studies indicate a possible protective vascular role and human studies link OPG with an increased cardiovascular risk (Schoppet et al., 2002).

Physical exercise has a protective action on bones, stimulating bone formation (Borer et al., 2005; Yang et al., 2014).

OPG is mainly produced by bones, but is also secreted by other numerous tissues including the cardiovascular structures (heart, arteries and veins), lungs, kidneys, hematopoietic and immune cells (Simonet et al., 1997; Schoppet et al., 2002). OPG is a member of the tumor necrosis factor receptor superfamily and it acts as a soluble decoy receptor for the receptor activator of nuclear factor kB-ligand (RANKL), blocking RANK activation (Yasuda et al., 1998). The synthesis of OPG is stimulated by several cytokines, such as TNF, interleukin (IL)-1, IL-18, transforming growth factor (TGF), bone morphogenetic

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proteins, and steroid hormones (Schoppet et al., 2002; Brandstrom et al., 2001). Some other molecules such as glucocorticoids, parathyroid hormone and prostaglandin E2 are known to inhibit OPG production (Yasuda et al., 1998; Vidal et al., 1998). RANKL (receptor activator of nuclear factor-kappa B ligand) is produced by osteoblastic lineage cells and activated T cells and stimulates osteoclast formation, differentiation and activation leading to bone resorption (Lacey et al., 1998).

RANK is the specific receptor of RANKL and is expressed in different cells such as osteoclasts, activated T cells and myeloid-derived dendritic cells (Schoppet et al., 2002; Nakagawa et al., 1998). RANKL activates its receptor RANK on osteoclasts, stimulating osteoclastogenesis (Yasuda et al., 1998; Schoppet et al., 2002). OPG acts as a soluble receptor of RANKL and prevents RANK activation, consequently inhibiting osteoclastogenesis and osteoclast activation (Yasuda et al., 1998; Caidahl et al., 2010). OPG also neutralizes the effect of TNF-related apoptosis inducing ligand (TRAIL), inhibiting the proapoptotic pathways (Yasuda et al., 1998; Caidahl et al., 2010).

RANKL and OPG are also involved in vascular calcification. It has been shown that OPG knockout mice develop osteoporosis and calcification of the media of aorta and renal arteries (Bucay et al., 1998). This was the first evidence that the RANK/OPG system may be involved in both osteoporosis and vascular calcification. Clinical and epidemiological studies underline the association of vascular calcification and cardiovascular complications in postmenopausal and elderly women with osteoporosis (Caidahl et al., 2010; Kado et al., 2000; Browner et al., 2001). The role of OPG in cardiovascular disease is still a subject of debate because experimental studies indicate a protective vascular role, while clinical and epidemiological research shows an association between increased OPG concentrations and cardiovascular diseases and mortality (Lieb et al., 2010; Nybo & Rasmussen, 2002).

OPG has been associated in many clinical studies with systemic inflammation and its markers, C reactive protein (CRP), fibrinogen, and the erythrocyte sedimentation rate (Libby, 2002). It has been suggested that OPG is a marker of inflammation because besides its association with inflammatory conditions and mediators, it is downregulated by anti-inflammatory molecules such as immunosuppressants and anti-TNF medications (Ziolkowska et al., 2002; Hofbauer et al., 2001; Hamerman, 2005).

Systemic inflammation is also involved in osteoporosis and it may be one of the links between atherosclerosis and bone loss. Many of the circulating inflammatory markers characteristic of atherosclerosis may interfere with bone metabolism and stimulate osteoblastic release of factors that stimulate osteoclastogenesis (Hamerman, 2005). Even though OPG inhibits the activation of osteoclasts, elevated circulating levels have been found in postmenopausal women with osteoporosis compared to matched controls. One possible explanation supports the hypothesis that the increase in OPG levels may be a compensatory mechanism for enhanced RANKL osteoclastic bone resorption (Hamerman, 2005).

Data regarding the effect of exercise on OPG levels are sparse. The aim of this article is to analyze the literature data evaluating the effects of physical exercise on circulating OPG and its correlation with the bone remodeling process.

Physical exercise and circulating OPG

Exercise has been reported to have favorable effects in both osteoporosis and cardiovascular disease. The precise mechanism by which physical exercise influences bone metabolism is not elucidated. Literature data support the hypothesis that bone mass is influenced principally by the increased mechanical strain because athletes practicing sports that generate high weight bearing or impact loading have a higher body mass density in comparison with athletes who practice sports with lower mechanical solicitations (Morel et al., 2001; Herrmann & Herrmann, 2004; Hinton et al., 2006). In addition, exercise may cause hormonal and bone metabolism changes, with the involvement of molecules responsible for bone turnover such as osteocalcin and the osteoprotegerin/RANK/RANKL axis (Maïmoun & Sultan, 2009; Herrmann & Herrmann, 2004; Hinton et al., 2006).

Exercise also has anti-inflammatory effects because contracting muscles release cytokines with anti-inflammatory actions (Mattush et al., 2000). Even if intense physical exercise determines muscular injuries and a local inflammatory reaction, regular exercise has anti-oxidative and anti-inflammatory effects (Pinto et al., 2012).

During the last 10-15 years, various studies have focused on the effect of physical activity on the OPG/RANKL/RANK system, but the results are conflicting. Studies include various populations and different types and periods of physical activities, and it is difficult to compare and extrapolate their results. We included in this analysis prospective studies that evaluated the effect of different types of physical activity on bone formation markers such as osteocalcin and bone alkaline phosphatase and on bone resorption markers including C-terminal cross-links of type I collagen in correlation with the OPG/RANK/RANKL system and body mass density (BMD). These studies are listed in Table I.

Resistance training studies

In a study that included forty healthy women (aged 45-60 years), the effects of two 12-week resistance training programs of different intensities (high intensity and low intensity) on bone turnover markers, BMD, OPG, and soluble receptor activator of nuclear factor kappa β ligand (soluble RANKL) were assessed (Karrarslan et al., 2010). The results indicate that both high intensity exercise and low intensity resistance training increased body mass density, with a more important effect for high intensity exercise. Changes in OPG were not significant and soluble RANKL decreased in all groups, suggesting that measures of these mediators may not be useful to predict body mass density or bone turnover status after resistance training exercise (Karrarslan et al., 2010).

In a study that included older women, the effects of a resistance training protocol and a moderate-impact aerobic training protocol (three times/week for 8 months) on bone mineral density (BMD), physical ability, serum OPG, and RANKL levels were compared (Marques et al., 2011).

After 8 months, only the resistance training group exhibited increases in BMD and improved body composition. Both types of exercise improved functional balance control strongly related to the risk of fall. These results were not accompanied by changes in OPG and RANKL levels or in the OPG/RANKL ratio (Marques et al., 2011).

In a group of elderly men and women, a combined exercise protocol (resistance and multicomponent weight-bearing impact exercise training) evaluated BMD at multiple sites, dynamic balance, muscle strength, serum levels of bone metabolism markers and inflammatory markers (Marques et al., 2013). The results suggest that these combined exercises reduce inflammation and increase BMD, balance, and lower-extremity muscle strength, despite having little effect on bone metabolism markers (Marques et al., 2013).

The acute effects of resistance training on pro-inflammatory and anti-inflammatory cytokines and OPG were tested in a study that included 24 sedentary middle-aged women divided into 2 groups with and without metabolic syndrome (Pereira et al., 2013). Women with metabolic syndrome had increased baseline pro-inflammatory cytokines and the acute resistance training did not induce an additional systemic response of OPG, pro- (TNF-a, IL-1-a, IL-6 and IL-12) and anti-inflammatory (IL-10) cytokines immediately and 60 min after exercise. The authors consider that submaximal resistance training is safe for patients with metabolic syndrome because no modification in pro-inflammatory cytokines was detected (Pereira et al., 2013).

Aerobic exercise training studies

In overweight and obese men and women, the impact

Table I

Studies evaluating the relationship between OPG, RANKL and physical exercise.

Studies	Subjects	Type of exercise	Outcome	Other results
Karaarslan et al., 2010 (30)	40 postmenopausal women (aged 45-60 years)	Resistance exercise for 12 weeks (comparison of three groups: high intensity exercise /low intensity exercise/ controls)	↓RANKL in all three groups ↔ OPG	↑ BMD ↑ osteocalcin
Marques et al., 2011	71 older women randomly assigned to 3 groups: resistance training/ aerobic exercise/ control group	Both types of exercise (resistance training and aerobic exercise) were performed 3 times/week, for 8 months	↔ OPG ↔ soluble RANKL ↔ OPG/RANKL	Resistance exercise determined: ↑ BMD ↑ muscle strength
Marques et al., 2013	47 healthy older adults (women=24, men=23; mean age 68.2 years)	Exercise intervention: 32 weeks (60 min/session): resistance exercise training (2 days/week) at 75-80% of maximum plus a multicomponent weight-bearing impact exercise training (1 day/week)	↔OPG ↔RANKL	↑ dynamic balance ↑ muscle strength ↑ BMD ↔ osteocalcin ↔ CTX ↓ hs-CRP, ↓ IFN-γ, ↔ TNF-α
Pereira et al., 2013 (33)	24 women divided in 2 groups: with and without metabolic syndrome	Acute resistance training: 3 sets of 10 repetitions in the following exercises: machine leg press, leg extension, leg curl, chest press, lat front pull-down and machine shoulder press with 60% of 1 repetition maximum, followed by 15 repetitions of abdominal crunches. A rest interval of 1 min was allowed between sets of exercises	↔ OPG measured immediately and 60 min after training	↔ TNF-α, IL-1a, IL-1β, IL-12, IL-6, IL-10 measured immediately and 60 min after training
Hinton et al., 2006	Overweight and obese men and women	6 weeks aerobic exercise (approximately 1675 kJ/d, walking or jogging at 60% maximum oxygen consumption) and energy restriction (reduced by approximately 3140 kJ/d)	↔ soluble RANKL	↑ osteocalcin, ↑ BAP ↔ CTX
Wieczorek-Baranowsk et al., 2012	44 postmenopausal women: 27 participated in the training program, and 17 in the control group	Cycle-ergometer physical workout at a level of 70% to 80% of ventilatory threshold intensity for 8 weeks (40-minute sessions, 3 times per week)	↔OPG	↓ osteocalcin ↓ HOMA-IR ↓waist-to-hip ratio ↔ CTX
Bergstrom et al., 2012	112 postmenopausal women aged 45–65 years randomized to either sedentary life (control) or physical activity (training)	Three fast 30-min walks and one or two 1-h aerobic training sessions per week for 1 year	↑ OPG	Non-significantly ↓ CTX ↓ BAP
Scott et al., 2010	11 recreationally active men, 10 endurance-trained men and 10 controls	An exhaustive treadmill run with determination of plasma parameters at baseline, during exercise and 1 to 4 days after exercise	↑ OPG after 20 min and remained elevated 1 day	↑ CTX for 4 days after training ↑ PTH for 4 days after training
Ziegler et al., 2005	31 long-distance runners	Running distances of either 15 or 42.195 km, respectively with evaluation before and immediately after the race	↓ soluble RANKL in both groups ↑ OPG only in runners covering 42.195 km	
Kerschan-Schindl et al., 2009	18 runners (16 men and 2 women)	Spatrathlon race 246 km Determinations of parameters at 15 min after the end of the race as well as three days after the race	↑ OPG ↑ RANKL Three days after the race	↑ CTX ↓ osteocalcin

Abbreviations: hs-CRP = hypersensitive C reactive protein; IFN- ɤ = interferon- ɤ; TNF-α = tumor necrosis factor-α; IL = interleukin; CTX = C-terminal telopeptide of collagen type I; BMD = body mass density; PTH = parathormone; HOMA-IR = Homeostasis Model Assessment-insulin resistance; ↑ increased; ↓ decreased; ↔ non-modified

of weight-bearing aerobic exercise training and diet-induced weight loss on bone turnover markers was investigated (Hinton et al., 2006). The subjects included in this study underwent 6 weeks of energy restriction (reduced by approximately 3140 kJ/d) and aerobic exercise (approximately 1675 kJ/d, walking or jogging at 60% maximum oxygen consumption) to induce a 5% reduction in body weight. After 6 weeks, bone formation markers, osteocalcin, and bone alkaline phosphatase, were significantly increased, and bone resorption markers, C-terminal cross-links of type I collagen and soluble RANKL, were unchanged. The authors concluded that weight-bearing aerobic exercise training may favorably affect the balance between bone resorption and bone formation during weight loss (Hinton et al., 2006).

In postmenopausal women, 8 weeks of aerobic exercise were associated with a decrease in central adiposity, osteocalcin levels and insulin resistance, without a significant modification of OPG (Wieczorek-Baranowska et al., 2012).

Postmenopausal women have also been evaluated after a prolonged exercise program. In one study, 112 postmenopausal women (92 completed the study) were enrolled in an exercise program consisting of three fast 30-min walks and one or two 1-h aerobic training sessions per week over 1 year (Bergström et al., 2012). The bone turnover markers C-terminal telopeptide of collagen type I and bone alkaline phosphatase decreased in the training group versus controls, but the changes were small, while OPG increased significantly. The authors concluded that this kind of exercise induced an OPG-dependent inhibition of bone mass loss in postmenopausal women (Bergström et al., 2012).

High intensity exercise studies

Acute and intense exercise stimulates bone resorption but not bone formation. After strenuous running in recreationally active men and endurance-trained men, bone resorption but not bone formation was increased (Scott et al., 2010). Increased bone resorption may be caused by an increase in PTH, whereas elevated OPG was considered a compensatory response to increased bone resorption. These modifications are not influenced by the training status (Scott et al., 2010).

Long-distance running has been shown to have a favorable effect on bone mass. Ziegler et al. (Ziegler et al., 2005) determined plasma concentrations of OPG and soluble RANKL in 31 long-distance runners before and immediately after running distances of either 15 or 42.195 km, respectively. In both groups of endurance runners, a significant decrease of soluble RANKL was observed during the run, the extent of which was correlated with the running distance. An increase in OPG was observed only in runners covering the marathon distance of 42.195 km. The authors speculated that the known positive effect of long-distance running on the skeletal mass may be mediated by the OPG/RANKL system (Ziegler et al., 2005).

Even if regular physical exercise exerts a favorable effect on the skeleton, excessive physical exercise may have opposite effects. Osteocalcin, cross-linked-C-telopeptide of type I collagen, OPG, and RANKL were determined in 18 runners who participated in Spartathlon, an annual ultramarathon race of 246 km. The results indicate increased bone resorption and suppressed bone formation (Kerschan-Schindl et al., 2009) (Table I).

The results of these studies indicate that exercise, including both aerobic and resistance training, has favorable effects on bone mass. Even though aerobic exercise, especially walking, is preferred, it is considered that resistance training may be superior to aerobic exercise because peak load is the most important factor affecting bone mineral content (Kerr et al., 1996). Muscle contraction increases mechanical stress that enhances fluid forces, which stimulates biochemical mechanisms involved in osteogenesis (Atapattu et al., 2015). A combination of aerobic exercise (such as walking) and high impact exercise (jogging or stepping) is recommended for optimal benefits in elderly persons (Atapattu et al., 2015).

The great majority of studies have shown no significant modification of circulating OPG and RANKL. We cannot speculate any correlation between OPG and RANKL changes in these studies.

An increase in OPG was found after a prolonged aerobic exercise program for 1 year in postmenopasal women (Bergstrom et al., 2012) and after long-distance running in the marathon race (Ziegler et al., 2005), suggesting a possible implication of OPG in bone mass protection and a role of OPG as a mediator of mechanical loading in humans. Nevertheless, excessive physical exercise may have opposite effects with increased bone resorption (Kerschan-Schindl et al., 2009). Acute and very intense exercise stimulated bone resorption but not bone formation, and the increase in OPG levels was considered a compensatory mechanism to increased bone resorption (Scott et al., 2010).

In conclusion, physical exercise induces favorable bone metabolic effects; the precise role of OPG and RANKL is not yet clear. There are important differences between studies regarding their exercise protocols, population, type and duration of exercises, time intervals between exercise programs and laboratory determinations. Moreover, as we mentioned before, there are very different sources of OPG and RANKL that could influence the circulating levels of these molecules. Further studies are necessary to elucidate the role of OPG and RANKL in the mechanism involved in the protective effect of exercise on bone metabolism.

References

Atapattu PM, Fernando D, Wasalathanthri S, de Silva A. Menopause and Exercise: Linking Pathophysiology to Effects iMedPub Journals, 2015. Available from: www.archivesofmedicine.com Accessed on 20.08.2016.

Bergström I, Parini P, Gustafsson SA, Andersson G, Jonas Brinck J. Physical training increases osteoprotegerin in postmenopausal women. J Bone Miner Metab 2012;30(2):202-207. doi: 10.1007/s00774-011-0304-6.

Borer KT. Physical activity in the prevention and amelioration of osteoporosis in women: interaction of mechanical, hormonal and dietary factors. Sports Med 2005;35(9):779-830.

Brandstrom H, Bjorkmann T, Ljunggren O. Regulation of osteoprotegerin secretion from primary cultures of human bone marrow stromal cells. Biochem Biophys Res Comm 2001;280(3):831–835.

Browner WS, Lui LY, Cummings SR. Associations of serum osteoprotegerin levels with diabetes, stroke, bone density, fractures, and mortality in elderly women. J Clin Endocrinol Metab 2001;86(2):631-637.

Bucay N, Sarosi I, Dunstan CR, Morony S, Tarpley J, Capparelli C et al. Osteoprotegerin-deficient mice develop early onset osteoporosis and arterial calcification. Genes Dev 1998;12(9):1260-1268.

Caidahl K, Ueland T, Aukrust P. Osteoprotegerin: A biomarker with many faces. Arterioscler Thromb Vasc Biol 2010;30(9):1684-1686. doi: 10.1161/ATVBAHA.110.208843.

Hamerman D. Osteoporosis and atherosclerosis: biological linkages and the emergence of dual-purpose therapies. Q J Med 2005;98(7):467-484.

Herrmann M, Herrmann W. The assessment of bone metabolism in female elite endurance athletes by biochemical bone markers. Clin Chem Lab Med 2004;42(12):1384-1389.

Hinton PS, Rector RS, Thomas TR. Weight-bearing, aerobic exercise increases markers of bone formation during short-term weight loss in overweight and obese men and women. Metabolism 2006;55(12):1616-1618.

Hofbauer LC, Shui C, Riggs BL, Dunstan CR, Spelsberg TC, O'Brien T et al. Effects of immunosuppressants on receptor activator of NF-kappaB ligand and osteoprotegerin production by human osteoblastic and coronary artery smooth muscle cells. Biochem Biophys Res Commun 2001;280(1):334-339.

Kado DM, Browner WS, Blackwell T, Gore R, Cummings SR. Rate of bone loss is associated with mortality in older women: a prospective study. J Bone Miner Res 2000;15(10):1974-1980.

Karaarslan S, Büyükyazi G, Taneli F, Ulman C, Tikiz C, Gümüşer G, Şahan P. Effects of different intensity resistance exercise programs on bone turnover markers, osteoprotegerin and receptor activator of nuclear factor kappa β ligand in post-menopausal women. Turkiye Klinikleri J Med Sci 2010;30(1):123-134.

Kerr D, Morton A, Dick I, Prince R. Exercise effects on bone mass in postmenopausal women are site-specific and load-dependent. J Bone Miner Res 1996;11(2): 218-225.

Kerschan-Schindl K, Thalmann M, Sodeck GH, Skenderi K, Matalas AL, Grampp S et al. A 246-km continuous running race causes significant changes in bone metabolism. Bone 2009;45(6):1079-1083.

Lacey DL, Timms E, Tan HL, Kelly MJ, Dunstan CR, Burgess T et al. Osteoprotegerin ligand is a cytokine that regulates osteoclast differentiation and activation. Cell 1998;93(2):3597-3602.

Libby P. Inflammation in atherosclerosis. Nature 2002;420(6917):868-874.

Lieb W, Gona P, Larson MG, Massaro JM, Lipinska I, Keaney JF Jr et al. Biomarkers of the osteoprotegerin pathway. Clinical correlates, subclinical disease, incident cardiovascular disease, and mortality. Arterioscler Thromb Vasc Biol 2010;30(9):1849-1854. doi: 10.1161/ATVBAHA.109.199661.

Marques EA, Mota J, Viana JL, Tuna D, Figueiredo P, Guimarães JT, Carvalho J. Response of bone mineral density, inflammatory cytokines, and biochemical bone markers to a 32-week combined loading exercise programme in older men and women. Arch Gerontol Geriatr 2013;57(2):226-233.

Marques EA, Wanderley F, Machado L, Sousa F, Viana JL, Moreira-Gonçalves D et al. Effects of resistance and aerobic exercise on physical function, bone mineral density, OPG and RANKL in older women. Exp Gerontol 2011;46(7):524-532.

Mattusch F, Dufaux B, Heine O, Mertens I, Rost R. Reduction of the plasma concentration of C-reactive protein following nine months of endurance training. Int J Sports Med 2000; 21(1):21-24.

Maïmoun L, Sultan C. Effect of physical activity on calcium homeostasis and calcitropic hormones: A review. Calcif Tissue Int 2009;85(4):277-286. doi: 10.1007/s00223-009-9277-z.

Morel J, Combe B, Francisco J, Bernard J. Bone mineral density of 704 amateur sportsmen involved in different physical activities. Osteoporos Int 2001;12(2):152-157.

Nakagawa N, Kinosaki M, Yamaguchi K, Shima N, Yasuda H, Yano K et al. RANK is the essential signaling receptor for osteoclast differentiation factor in osteoclastogenesis. Biochem Biophys Res Comm 1998;253(2):395-400.

Nybo M, Rasmussen LM. The capability of plasma osteoprotegerin as a predictor of cardiovascular disease: a systematic literature review. Eur J Endocrinol 2008;159(5):603-608. doi: 10.1530/EJE-08-0554.

Pereira GB, Tibana RA, Navalta J, Sousa NM, Cordova C, Souza VC et al. Acute effects of resistance training on cytokines and osteoprotegerin in women with metabolic syndrome. Clin Physiol Funct Imaging 2013;33(2):122-130. doi: 10.1111/cpf.12004.

Pinto A, Di Raimondo D, Tuttolomondo A, Buttà C, Milio G, Licata G. Effects of physical exercise on inflammatory markers of atherosclerosis. Curr Pharm Des 2012;18(28):4326-4349.

Schoppet M, Preissner KT, Hofbauer LC. RANK Ligand and Osteoprotegerin Paracrine Regulators of Bone Metabolism and Vascular Function. Arterioscler Thromb Vasc Biol 2002;22(4):549-553.

Scott JP, Sale C, Greeves JP, Casey A, Dutton J, Fraser W. The effect of training status on the metabolic response of bone to an acute bout of exhaustive treadmill running. J Clin Endocrinol Metab 2010;95(8):3918-3925.

Simonet WS, Lacey DL, Dunstan CR, Kelley M, Chang M-S, Lüthy R et al. Osteoprotegerin: a novel secreted protein involved in the regulation of bone density. Cell 1997;89(2):309-319.

Vidal NO, Brandstrom H, Jonsson KB, Ohlsson C. Osteoprotegerin mRNA is expressed in primary human osteoblast-like cells: downregulation by glucocorticoids. J Endocrinol 1998;159(1):191-195.

Wieczorek-Baranowska A1, Nowak A, Pilaczyńska-Szcześniak Ł. Osteocalcin and glucose metabolism in postmenopausal women subjected to aerobic training program for 8 weeks. Metabolism 2012;61(4):542-545.

Yang Z, Scott CA, Mao C, Tang J, Farmer A. Resistance exercise versus aerobic exercise for type 2 diabetes: a systematic review and meta-analysis. Sports Med 2014;44(4):487-499.

Yasuda H, Shima N, Nakagawa N, Yamaguchi K, Kinosaki M, Mochizuki SI et al. Osteoclast differentiation factor is a ligand for osteoprotegerin/osteoclastogenesisinhibitory factor and is identical to TRANCE/RANKL. Proc Natl Acad Sci USA. 1998;95(7):3597-3602.

Ziegler S1, Niessner A, Richter B, Wirth S, Billensteiner E, Woloszczuk W et al. Endurance running acutely raises plasma osteoprotegerin and lowers plasma receptor activator of nuclear factor. Metabolism 2005;54(7):935-938.

Ziolkowska M, Kurowska M, Radzikowska A, Luszczykiewicz G, Wiland P, Dziewczopolski W et al. High levels of osteoprotegerin and soluble receptor activator of nuclear factor kappa B ligand in serum of rheumatoid arthritis patients and their normalization after anti-tumor necrosis factor alpha treatment. Arthritis Rheum 2002;46(7):1744-1753.

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The efficiency and safety of L-carnitine and caffeine after short- and long-term administration

Eficacitatea și siguranța L-carnitinei și cafeinei după administrarea pe termen scurt și lung

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Abstract

L-carnitine and caffeine are excessively used by athletes for increasing or prolonging sport performance due to their ergogenic effects. These supplements are considered harmless among athletes, but the specialized data regarding their safety in long-term administration, in high doses, are not sufficient. On the other hand, the studies that support the effectiveness of these products are numerous, encouraging their use. This review was designed to emphasize the idea that the administration of these supplements is not as safe as it seems to be. Homeostasis of the body can be affected, especially in their long-term administration. Considering these issues, athletes are advised to be cautious and knowledgable before starting to use these supplements.

Key words: efficiency, safety, L-carnitine, caffeine, athletes.

Rezumat

L-carnitina şi cafeina sunt utilizate în mod excesiv de către sportivi pentru creșterea sau susținerea performanței sportive datorită efectelor ergogenice. Aceste suplimente sunt considerate inofensive în rândul sportivilor, însă datele de specialitate privind siguranța lor în administrare pe termen lung şi în doze mari, nu sunt suficiente. În schimb, sudiile care susțin eficiența acestor produse sunt numeroase, încurajând utilizarea lor. Acest studiu a fost conceput pentru a sublinia faptul că administrarea acestor suplimente nu este atât de sigură precum pare a fi. Homeostazia organismului poate fi afectată, mai ales în administrarea acestora pe termen îndelungat. Având în vedere aceste aspecte, sportivii sunt sfătuiți să fie prudenți și bine informați înainte de a recurge la utilizarea acestor suplimente.

Cuvinte cheie: eficinență, siguranță, L-carnitină, cafeină, sportivi.

Introduction

The use of nutritional supplements by athletes to improve their performance has gone through a surprising evolution in the last decade. A complete analysis of 51 studies including a total of 10,274 athletes reveals that a share of 46% have constantly used dietary supplements, including ergogenic substances (Apostu, 2014). In addition, these supplements are administered chaotically in terms of frequency, quantity and duration.

The inconvenience is that many nutritional supplements and pharmacological substances such as L-carnitine or caffeine are used excessively, without knowing the clear effects on human homeostasis after acute or chronic administration. In this context, it is important to evaluate efficiency and safety before taking these supplements, because they can be harmful to the body if not administered correctly.

In our review, we aimed to emphasize the efficiency and safety of L-carnitine and caffeine in short- and long-term administration, considering their extensive use in sports field.

L-carnitine

Carnitine is a hydrophilic quaternary amine with important functions in intermediary metabolism, its biological activity being due to the "levo" isomer form. The primary role played by carnitine is in the process of mitochondrial β oxidation. Carnitine translocates the long-chain fatty acids into the mitochondrial matrix, where oxidation occurs and energy results (Pekala et al., 2011; Traina, 2016).

This action is essential in the metabolism of fatty acids,

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because without this transport, β oxidation would not occur, leading to accumulation of these compounds, with negative effects on the body (Wu et al., 2015).

Carnitine is biosynthesized from the essential amino acids lysine and methionine in a concentration of 1.2 μmol/kg/day, but can also be obtained through dietary intake. Exogenous carnitine intake can be achieved from lamb (the highest amount), beef steak, chicken, fish, and red meat. A regular diet provides 2-12 μmol/kg/day (El-Hattab & Scaglia, 2015).

In the field of sports nutrition, L-carnitine is widely used by athletes as an ergogenic aid to enhance exercise performance and to reduce oxidative stress (Sung et al., 2016; Su et al., 2015).

Several studies have shown that L-carnitine is effective in controlling oxidative stress, holding an antioxidant effect, even after a single oral dose administration (2 g), by increasing the plasma concentrations of superoxide dismutase, glutathione peroxidase, catalase and total antioxidative capacity (Cao et al., 2011).

Regarding the production of nitric oxide after acute administration of L-carnitine at a concentration of 3 g/day and 4 g/day, respectively, it can be observed that the concentration of nitric oxide is increased, which reveals one more time the antioxidant role of L-carnitine (Atalay et al., 2015).

Besides its antioxidant effect, recent studies have shown that L-carnitine fulfills a beneficial function in the recovery process after physical exercises, reducing tissue damage related to hypoxic stress (Huang & Owen, 2012).

Another study aimed to evaluate the benefits of acute administration of L-carnitine on endurance performance in athletes, and the results showed that increasing the concentration of L-carnitine delays physical exhaustion (Orer & Guzel, 2014; Stephens et al., 2013).

On the other hand, regarding the short-term pre-ischemic administration of L-carnitine on isolated rat heart, L-carnitine seems to produce arrhythmogenic activity, which allows concluding that acute administration of L-carnitine supplements in patients with coronary artery disease should be thoroughly studied in the near future (Najafi & Garjani, 2014).

In contradiction to the previously cited study, Lee BJ et al. showed that L-carnitine supplementation at a dose of 1000 mg/day for 12 weeks has a beneficial effect in inflammation of coronary artery disease, probably due to its antioxidant properties (Lee et al., 2015).

It is known in the literature that chronic L-carnitine supplementation in a dose of 2 g/day has the property to reduce metabolic stress after exercise (Broad et al., 2008).

In this context, Parandak et al. (2014) assessed the effect of 2 g/day of L-carnitine supplementation for 2 weeks on lipid peroxidation and muscle damage markers. The conclusion was that long-term L-carnitine supplementation has beneficial effects following an acute bout of exercise in active healthy men.

An interesting issue was assessed by Novakova et al. (2016) in a recent study evaluating the difference between the effect of L-carnitine supplementation on vegetarian and omnivorous males. After oral supplementation of 2 g/day for 12 weeks, it was shown that plasma carnitine concentrations were lower in vegetarian males compared to plasma concentration in omnivorous males, but muscle carnitine stores were maintained, without affecting muscle homeostasis.

According to literature data, it can be concluded that doses ranging from 1-5 g/day are effective to enhance performance exercise and control oxidative stress both in acute and chronic administration. Since only a limited number of studies have focused on the safety of high dose administration of L-carnitine, it is difficult to establish an optimal mode of administration.

However, even if a dietary reference intake has not been officially established by The Food and Nutrition Board, the Ministry of Health and Welfare in Taiwan recommends a dose under 2000 mg/day (Sung et al., 2016).

Caffeine

Caffeine (1,3,7- trimethylxanthine) is a plant-derived alkaloid widely used as a central nervous system stimulant, nowadays being the most consumed psychoactive substance in the world (Holstege & Holstege, 2014; Mitchell et al., 2013).

The mechanism of action on the central nervous system consists of a blockade of adenosine receptors, explaining the stimulation of neuronal activity and other physiological effects, such as an increase in muscle recruitment. Caffeine also inhibits phosphodiesterase activity, increasing the plasma levels of catecholamines, stimulating the glycolysis process with a higher production of energy in muscle during exercise (Meeusen et al., 2013).

The mechanism of the ergogenic effect in high intensity exercise remains unclear, even if the literature reports the efficiency due to a combined action between central and peripheral systems (Astorino & Roberson, 2010; Black et al., 2015).

Caffeine supplementation improves sport performance, especially when consumed in an anhydrous state such as powder or capsules (Duncan et al., 2014), but this improvement is dependent on various other factors including the athlete's condition, the intensity of exercise and the dose of caffeine.

Schubert et al. showed that the consumption of caffeine (3 mg/kg/body weight) before and after a bout of moderate exercise improves fat oxidation and increases energy expenditure, and Olcina et al. showed that 5 mg/kg body weight of caffeine ingested 60 minutes before exercise induce beneficial effects on the plasma total fatty acid profile, providing ergogenic action (Schubert et al., 2014; Olcina et al., 2012).

It has been shown by various studies that caffeine supplementation in doses between 3-9 mg/kg body weight increases sport performance proportionally to the dose, improving the aerobic exercise capacity of endurance athletes by 7-35%. When consumed in higher doses (≥ 9 mg/kg), an improvement in performance is no longer noticed (Apostu, 2014) and the incidence of side effects can increase (Pallarés et al., 2013).

Regarding the time of administration in relation to the time of physical activity, caffeine should be ingested 60 minutes prior to exercise, to ensure an optimal absorption (Goldstein et al., 2010).

Pitchford et al. (2014) showed in a recent study that a moderate dose of caffeine supplementation (3 mg/kg body weight) improved the cycling performance and in doses of 5 mg/kg body mass, in acute administration, caffeine proved to delay fatigue during successive taekwondo combats (Santos et al., 2014).

In order to avoid adverse effects resulting from the administration of high doses of caffeine, Spriet aimed to evaluate the efficiency of low doses of caffeine supplementation, concluding that caffeine improves sport performance, vigilance and alertness, even if not consumed in high doses (Spriet, 2014).

In the same context, Diaz-Lara et al. (2015) determined the efficacy of ingestion of caffeine in a moderate concentration (3 mg/kg body mass), showing that this substance enhances high-intensity actions and physical performance.

However, in the literature there are studies that deny the ergogenic effect of caffeine intake.

Some researchers concluded that after supplementation with 6 mg/kg body weight caffeine, performance in judo fitness was not improved and after 5 mg/kg body weight caffeine intake, during simulated taekwondo combat, there were no increases in performance (Lopes-Silva et al., 2014; Lopes-Silva et al., 2015).

In terms of toxicology, chronic consumption of caffeine can lead to tolerance, withdrawal and substance dependence syndrome, consisting of fatigue, headache, irritability, anxiety (Morelli & Simola, 2011; Turnbull et al., 2016).

In addition, studies have confirmed that caffeine could suppress the ossification process in chronic high dose administration, leading to bone loss and predisposition to fractures (O'Keefe et al., 2013; Shin et al., 2015).

Regarding recent studies focused on caffeine administration and blood flow, it has been shown that caffeine consumption combined with physical exercise decreases myocardial blood flow (Higgins & Babu, 2013). Bunsawat et al. (2015) reports that ingestion of 400 mg caffeine followed by a maximal treadmill test to exhaustion stimulates catecholamine release and could lead to a pro-arrhythmogenic state.

Studies evaluating the risks after administration of high (> 600 mg/day) and very high (> 1200 mg/day) doses of caffeine are limited. Therefore, it is difficult to clearly define the level of side effects. Searching for a safe alternative to anhydrous caffeine consumption, Higgins et al. found that coffee containing 3-8.1 mg/kg body weight caffeine should be efficient in improving endurance performance (Higgins et al., 2016).

Conclusions

After reviewing the literature, the following conclusions can be drawn:

1. Although supplementation with L-carnitine is proven to be very effective and safe, data regarding intakes above 2000 mg/day in chronic treatment, especially in people prone to heart disease, are not enough and this issue needs a thorough investigation.

2. Caffeine supplementation improves sports performance taking into account several important factors: the athlete's condition, the intensity of exercise, the pharmaceutical form, and last but not least, the dose of caffeine.

3. Even if L-carnitine and caffeine have been proven to enhance the performance of athletes in acute or chronic administration, there are studies supporting that their efficiency as ergogenic aids is not clear.

4. Considering that only a limited number of studies are focused on safety after chronic and high dose administration, athletes should be careful and knowledgeable before taking these supplements.

Conflict of interests

There were no conflicts of interests.

References

Apostu M. The effect of ergogenic substances over sports performance. Procedia-Soc Behav Scie, 2014; 117:329-334.

Astorino TA, Roberson DW. Efficacy of acute caffeine ingestion for short-term high-intensity exercise performance: a systematic review. J Strength Cond Res. 2010; 24(1):257-265.

Atalay Guzel N1, Erikoglu Orer G, Sezen Bircan F, Coskun Cevher S. Effects of acute L-carnitine supplementation on nitric oxide production and oxidative stress after exhaustive exercise in young soccer players. J Sports Med Phys Fitness 2015;55(1-2):9-15.

Black CD, Waddell DE, Gonglach AR. Caffeine's ergogenic effects on cycling: neuromuscular and perceptual factors. Med Sci Sports Exerc. 2015;47(6):1145-1158.

Broad EM, Maughan RJ, Galloway SD. Carbohydrate, protein, and fat metabolism during exercise after oral carnitine supplementation in humans. Int J Sport Nutr Exerc Metab. 2008;18(6):567-584.

Bunsawat K, White DW, Kappus RM, Baynard T. Caffeine delays autonomic recovery following acute exercise. Eur J Prev Cardiol. 2015; 22(11):1473-1479.

Cao Y, Qu HJ, Li P, Wang CB, Wang LX, Han ZW. Single dose administration of L-carnitine improves antioxidant activities in healthy subjects, Tohoku J Exp Med. 2011; 224(3):209-213.

Diaz-Lara FJ, Del Coso J, Portillo J, Areces F, García JM, Abián-Vicén J. A moderate dose of caffeine enhances high-intensity actions and physical performance during a simulated brazilian Jiu-Jitsu competition. Int J Sports Physiol Perform. 2015, [Epub ahead of print] DOI:10.1123/ijspp.2015-0686.

Duncan MJ, Thake CD, Downs PJ. Effect of caffeine ingestion on torque and muscle activity during resistance exercise in men. Muscle Nerve 2014;50(4):523-527.

El-Hattab AW, Scaglia F. Disorders of carnitine biosynthesis and transport. Mol Genet and Metab 2015; 116(3):107-112.

Goldstein ER, Ziegenfuss T, Kalman DKreider R, Campbell B, Wilborn C, Taylor L, Willoughby D, Stout J, Graves BS, Wildman R, Ivy JL, Spano M, Smith AE, Antonio J. International society of sports nutrition position stand: caffeine and performance. J Int Soc Sports Nutr. 2010;7(1):5.

Higgins JP, Babu KM. Caffeine reduces myocardial blood flow during exercise. Am J Med 2013;126(8):730-738.

Higgins S, Straight CR, Lewis RD. The effects of preexercise caffeinated coffee ingestion on endurance performance: An evidence-based review. Int J Sport Nutr Exerc Metab. 2016;26(3):221-239.

Holstege CP & Holstege E. Caffeine. Reference Module in Biomedical Sciences. Encyclopedia of Toxicology (Third Edition) 2014, 617-620.

Huang A, Owen K. Role of supplementary L-carnitine in exercise and exercise recovery. Med Sport Sci. 2012;59:135-142. doi: 10.1159/000341934.

Lee BJ, Lin JS, Lin YC, Lin PT. Antiinflammatory effects of L-carnitine supplementation (1000 mg/d) in coronary artery disease patients. Nutrition, 2015;31(3):475-479.

Lopes-Silva JP, Felippe LJ, Silva-Cavalcante MD, Bertuzzi R, Lima-Silva AE. Caffeine ingestion after rapid weight loss in judo athletes reduces perceived effort and increases plasma lactate concentration without improving performance. Nutrients. 2014;6(7):2931-2945.

Lopes-Silva JP, Silva Santos JF, Branco BH, Abad CC, Oliveira LF, Loturco I, Franchini E. Caffeine Ingestion Increases Estimated Glycolytic Metabolism during Taekwondo Combat Simulation but Does Not Improve Performance or Parasympathetic Reactivation. PLoS One. 2015;10(11):e0142078.

Meeusen R, Roelands B, Spriet LL. Caffeine, exercise and the brain. Nestle Nutr Inst Workshop Ser. 2013;76:1-12.

Mitchell DC, Knight CA, Hockenberry J et al. Beverage caffeine intakes in the US. Food Chem Toxicol 2013;63:136–142. doi: 10.1016/j.fct.2013.10.042.

Morelli M, Simola N. Methylxanthines and drug dependence: a focus on interactions with substances of abuse. Handb. Exp. Pharmacol. 2011;(200):483-507. doi: 10.1007/978-3-642-13443-2_20.

Najafi M, Garjani A. Short term administration of L-carnitine can be detrimental to the ischemic heart. Adv Pharm Bull. 2014;4(1):1-3.

Novakova K, Kummer O, Bouitbir J, Stoffel SD, Hoerler-Koerner U, Bodmer M, Roberts P, Urwyler A, Ehrsam R, Krähenbühl S. Effect of L-carnitine supplementation on the body carnitine pool, skeletal muscle energy metabolism and physical performance in male vegetarians. Eur J Nutr. 2016;55(1):207-217.

O'Keefe JH, Bhatti SK, Patil HR, DiNicolantonio JJ, Lucan SC, Lavie CJ. Effects of habitual coffee consumption on cardiometabolic disease, cardiovascular health, and all-cause mortality. J Am Coll Cardiol. 2013;62(12):1043-1051.

Olcina G, Munoz D, Kemp J, Timona R, Maynarc J, Caballerod MJ, Maynar M. Total plasma fatty acid responses to maximal incremental exercise after caffeine ingestion. J Exerc Sci Fit 2012;10:33-37.

Orer GE, Guzel NA. The effects of acute L-carnitine supplementation on endurance performance of athletes. J Strength Cond Res. 2014;28(2):514-519.

Pallarés JG, Fernández-Elías VE, Ortega JF, Muñoz G, Muñoz-Guerra J, Mora-Rodríguez R. Neuromuscular responses to incremental caffeine doses: performance and side effects. Med Sci Sports Exerc. 2013;45(11):2184-2192.

Parandak K, Arazi H, Khoshkhahesh F, Nakhostin-Roohi B. The effect of two-week L-carnitine supplementation on exercise-induced oxidative stress and muscle damage. Asian J Sports Med. 2014;5(2):123-128.

Pekala J, Patkowska-Sokoła B, Bodkowski R, Jamroz D, Nowakowski P, Lochyński S, Librowski T. L-carnitine-metabolic functions and meaning in humans life. Curr Drug Metab. 2011;12(7):667-678.

Pitchford NW, Fell JW, Leveritt MD, Desbrow B, Shing CM. Effect of caffeine on cycling time-trial performance in the heat. J Sci Med Sport. 2014;17(4):445-449.

Santos VG, Santos VR, Felippe LJ, Almeida JW Jr, Bertuzzi R, Kiss MA, Lima-Silva AE. Caffeine reduces reaction time and improves performance in simulated-contest of taekwondo. Nutrients. 2014;6(2):637-649.

Schubert MM, Hall S, Leveritt M, Grant G, Sabapathy S, Desbrow B. Caffeine consumption around an exercise bout: effects on energy expenditure, energy intake, and exercise enjoyment. J Appl Phys 2014;117(7):745-754.

Shin J, Choi Y, Kim J, Yu AR, Shin JS, Choi YY, Roh J. High doses of caffeine reduce in vivo osteogenic activity in prepubertal rats. J Anat. 2015;227(1):10-20.

Spriet LL. Exercise and sport performance with low doses of caffeine. Sports Med. 2014;44(2):175-184.

Stephens FB, Wall BT, Marimuthu K Shannon CE, Constantin-Teodosiu D, Macdonald IA, Greenhaff PL. Skeletal muscle carnitine loading increases energy expenditure, modulates fuel metabolism gene networks and prevents body fat accumulation in humans. J Physiol. 2013;591(18):4655-4666.

Su CC, Chang CS, Chou CH, Wu YHS, Yang KT, Tseng JK, Chang YY, Chen YC. L-carnitine ameliorates dyslipidemic and hepatic disorders induced by a high-fat diet via regulating lipid metabolism, self-antioxidant capacity, and inflammatory response. J Funct Foods 2015;15:497-508.

Sung DJ, Kim S, Kim J, And HS, So WY. Role of l-carnitine in sports performance: Focus on ergogenic aid and antioxidant. Sci & Sports 2016, [Epub ahead of print]. doi:10.1016/j.scispo.2016.02.005.

Traina G. The neurobiology of acetyl-L-carnitine. Front Biosci (Landmark Ed). 2016;21:1314-1329.

Turnbull D, Rodricks JV, Mariano GF. Neurobehavioral hazard identification and characterization for caffeine. Regul Toxicol and Pharm 2016;74:81-92. doi: 10.1016/j.yrtph.2015.12.002.

Wu T, Guo A, Shu Q, Qi Y, Kong Y, Sun Z, Sun S, Fu Z. L-Carnitine intake prevents irregular feeding-induced obesity and lipid metabolism disorder. Gene 2015;554(2):148-154.

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Nicolae Martin, the most successful coach in the history of Cluj women's basketball

Nicolae Martin, cel mai performant antrenor din istoria baschetului feminin clujean

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Abstract

This work is part of a series of papers that aim to bring to the attention of sports fans a number of Cluj sports personalities, sportsmen, coaches, managers – with remarkable results at national and international level. The authors illustrate the role that coach Nicolae Martin played in developing women's basketball in Romania, particularly at the "Universitatea" Cluj-Napoca club.

After the introductory part, concerned with the motivation and importance of their approach, the authors present Nicolae Martin's beginnings as a coach, the efforts and results that foreshadowed his later great achievements. Next, they illustrate the period during which, under his leadership, the "Universitatea" Cluj-Napoca women's basketball team achieved the greatest results in its history, ten national champion titles, eight starts at different stages of the European Champions Cup and one start at the Liliana Ronchetti Cup. They also show his results as a coach of various national teams of Romania that he trained and led to the Balkan Championships, European Championships and World University Games.

Key words: sports history, personalities, basketball, Cluj-Napoca

Rezumat

Lucrarea se înscrie în ciclul de articole care urmăresc să readucă în atenţia iubitorilor sportului o seamă de personalităţi ale sportului clujean - sportivi, antrenori, manageri - cu rezultate deosebite pe plan naţional şi internaţional. Autorii prezintă rolul avut de antrenorul Nicolae Martin la dezvoltarea baschetului feminin din România, în mod deosebit al celui din cadrul Clubului Sportiv Universitatea Cluj-Napoca.

După partea introductivă, care se referă la motivaţia demersului şi importanţa acestuia, autorii prezintă primii ani de activitate ca antrenor a lui Nicolae Martin, eforturile şi rezultatele care au prefigurat viitoarele sale mari realizări. În continuare este prezentată perioada în care, sub conducerea sa, echipa feminină de baschet Universitatea Cluj-Napoca a obţinut cele mai valoroase performanţe din istoria sa, zece titluri de campioană naţională, opt participări în diferite etape ale Cupei Campionilor Europeni şi o participare în Cupa Liliana Ronchetti. De asemenea, sunt prezentate rezultatele sale ca antrenor ale echipelor naţionale ale României pe care le-a pregătit şi condus la Campionatele Balcanice, Campionatele Europene şi Jocurile Mondiale Universitare.

Cuvinte cheie: istoria sportului, personalităţi, baschet, Cluj-Napoca.

Introduction

In a history of almost seventy years, the achievements of women's basketball made this section the most successful one among all team sports at the "Universitatea" Cluj-Napoca Sports Club. These achievements were possible because Cluj women's basketball enjoyed a succession of generations of remarkable players, who had a major contribution to the team's successes. Also, at that epoch the history of women's basketball at the University's club was marked by a series of coaches such as Alexandru Şerban, Vasile Geleriu, Nicolae Martin and Horia Pop, who remained in the memory of sports lovers in our city for the manner they carried out their profession, for the way they guided the destinies of many generations of basketball players in and outside the arena and for the results accomplished. Among these coaches with a vocation and with outstanding achievements, a special place belongs to Nicolae Martin, the expert under whose leadership the team won ten champion titles and finished once in the

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second place in the national championship.

We believe that on the eve of celebrating his 80th birthday, at the thirty-fifth anniversary of the conquest of the first national champion title in the series of ten achieved by the "Universitatea" Cluj-Napoca team with Nicholas Martin as a coach, it is a fit occasion to recall the successes accomplished and pay homage to the man who remained in the memory and hearts of the people of Cluj as a great coach, faithful in his love for Cluj university women's basketball, which he served with passion and dedication for two decades.

Fig. 1 – Coach Nicolae Martin (Merca-Bagiu M, 1982).

Apprenticeship as a coach

After a spell as a player in Sibiu and Cluj, in 1960, at the age of twenty-three, he started his career as a coach at "Clubul Sportiv Școlar Cluj" (***, 2002). The manifest vocation for the profession, the abilities displayed in those two years of work recommended him to take over, in the summer of 1962, the first team of the "Asociația Sportivă Armata" Cluj (Martin, 1972).

The professionalism that Nicolae Martin showed in preparing the team, effectively capitalizing on the potential of his players, the skills that he displayed in leading the team in competitions, helped "Asociația Sportivă Armata" to a first place at the basketball Championship of the Cluj Region and, following the results managed at the four qualifying championships, to a division A promotion (***, 1963). In the following years, "Asociația Sportivă Armata" coped honorably with the demands of competition in the second series of women's A Division, finishing in the 8th place in the 1964/1965 edition (***, 1965) and in the 3rd place in the 1965/1966 edition (***, 1966). After the reorganization of the competitive system, the team was one of the best in the B Division championship (***, 1967).

In 1968 there came another notable achievement in his early career, the promotion of his team in the A division (***, 1968). The offered conditions, the provided training led to some good results in the first division, ranking 4th in 1970 (***,1970), 6th in 1971 (***, 1971) and 8th in 1972 (***, 1972a). All this helped the "Asociația Sportivă Armata" establish itself as the main women's basketball section in Cluj-Napoca at the beginning of the '70s.

The making of a competitive team

The failed experience of having two women's teams from Cluj in the A Division, the decline of the university team at the beginning of the '70s determined the ruling bodies of the sports movement in the city and the members of the basketball sections of the "Universitatea" Sports Club and "Asociația Sportivă Armata" to act to rectify the situation. In the autumn of 1972, after long debates and complex analyses, a decision was reached to merge the sections of the two sporting structures, the first division team continuing its activity under the name of "Universitatea". In the wake of this decision, Nicolae Martin was appointed as the coach of the team resulted after the merge, while Vasile Geleriu, the former coach, took the leadership of the men's university team (***, 1972b). The choice of the club rulers reflected the fact that they acknowledged the merits of Nicolae Martin, his proven professional value and organizational abilities, and rated highly his work and results.

Even though it appeared that the team came out strengthened by the merger, the results of the first half of the 1972/1973 Republican Basketball Championship, the A Division, showed that some of the players in the squad were not up to the standards of the highest level of women's basketball. Following this conclusion, in the interval between the two halves of the season a reshuffle of the squad was started. In this process, Nicolae Martin knew how to blend the value and experience of players such as Olimpia Păcurar-Nețа, Floarea Trandafir-Anca, Agneta Farkas, Enikö Farkas or Ildiko Sipos with the youthful impetus, desire for progress and talent of junior players promoted from the "Clubul Sportiv Școlar" such as Mariana Victoria Merca, Liana Jichișan, Viorica Moraru and Irina Székely.

In the following years, the working climate established by the coach, the exigency that he manifested in training, the players' desire to improve and distinguish themselves, to achieve better and better results, determined an increase in the training quality, an improvement of the team's performance and some meritorious rankings in the first division of women's basketball (Paloșanu, 1995). But even if it was obvious that the team was on a good track, the lack of experience of some players in properly dealing with highly tense limit situations occurring in high-stake games, the inconsistency of their performance from game to game proved that there was still much work to be done in order to properly exploit the potential of each player, to fully distinguish as a team.

The years of great achievements in national competitions

Year after year Nicolae Martin, a competent, ambitious, consistent professional, homogenized the squad and optimized training to form a team able to win the championship title. At the start of the 1980/1981 championship, although judging by the previous results and transfers the team was not among the favorites, Nicolae Martin knew how to adjust training, to maximize the performance of the essential players, to motivate all the members of the squad to surpass themselves through work, ambition and dedication. Therefore, on March 8, 1981, in Brașov, "Universitatea" Cluj-Napoca, with a squad that included Floarea Trandafir-Anca, Doina Prăzaru-Máthé, Mariana Victoria Merca, Mândica Ciubăncan, Viorica Moraru-Jurcă, Virginia Popa, Adriana Mangu, Hanelore

Schuster-Adăscăliței, Elisabeta Czeglédi, Sibille Lukasz, Adriana Tarnița, Ioana Macavei, Dana Perțache and Claudia Perțache, finished the Women's Basketball Republican Championship, the A Division, in the first place, winning after twenty-seven years a new title of national champions (***, 1981a).

In the autumn of 1981, the team was strengthened by the transfer of Magdalena Páll and in the next four years it finished three times in the first place, 1982 (Stănculescu, 1982), 1984 (Stănculescu, 1984a), 1985 (Stănculescu, 1985a) and once in the second place, 1983 (Iovan, 1983a).

Fig. 2 – The "Universitatea" Cluj-Napoca team, champion for the second time. Nicolae Martin, Haidemarie Schuster, Floarea Trandafir-Anca, Mariana Merca-Bagiu, Annemarie Kirr, Virginia Popa, Elisabeta Czegledi, Adriana Mangu, Viorica Morar-Jurcă, Sibille Lakas, Doina Prăzaru-Máthé, Magdalena Páll and Gheorghița Bolovan (Merca-Bagiu M, 1982).

Starting with the summer of 1985, the training of the "Universitatea Clubul Sportiv Școlar Viitorul Cluj-Napoca" team was carried out by the couple Nicolae Martin, head coach, and Horia Pop, assistant coach. Although some skeptics feared that the two experts were incompatible, because of different visions regarding some aspects of training and leadership styles, in the period 1985-1991, inspired by achieving their common goals, they successfully overcame the differences and obstacles that stood in their way, complemented each other, forming a tandem known for its value and durability and contributed to winning the national championships six times (Stănculescu & Iovan, 1986; Stănculescu, 1987; Stănculescu, 1988; Iovan, 1989; Stănculescu, 1990; Stănculescu, 1991).

In the autumn of 1991, some health issues forced him to quit the coach job. As chairman of the "Universitatea" Cluj-Napoca Sports Club, he continued to work with Horia Pop and had a well-known contribution to winning the national championships in 1992 and 1993 (Radu, 1994).

In official international club competitions

Starting with the autumn of 1981, the "Universitatea" Cluj-Napoca women's basketball team, under the leadership of Nicolae Martin, entered the circuit of official international club competitions (***, 1981b). In the following years, the team from Cluj played forty-eight matches at various stages of the eight editions of the European Champions Cup in which it participated. In these matches, "Universitatea" played against twenty-one teams and achieved thirty-one victories. Also, in the 1982/1983 edition of the Liliana Ronchetti Cup, the Cluj team played four matches, winning two. "Universitatea" won against renowned teams that had impressive records, such as Minior Pernik (***, 1981c), Ceramica Pegnosin Trevisio (Radu, 1982), Unimato Cesena (Iovan, 1983b), Stade Francaise Paris, (Stănculescu, 1984b) Partizan Belgrade (Vasiliu, 1986a), Levski Spartak Sofia (Iovan, 1986), Primigi Vicenza (Stănculescu, 1986), Red Star Belgrade (***, 1986).

Fig. 3 – The "Universitatea" Cluj-Napoca team in the European Champions Cup (1986), the match against Lodski KS Lodz from Poland. Magdalena Páll, Ildiko Manasses, Paula Misăilă, Gabriela Mărginean, Tünde Enyedi, Virginia Popa, Carmen Costanașiu, Susana Sándor, Aurora Dragoș (Manasses, 1986).

Also, among the teams defeated by the team led by Nicolae Martin, one can mention the champions of Greece, Sporting of Athens; Great Britain, Southgate Technical College of London; Turkey, Besiktas Istanbul, Maden Technic Ankara, Galatasaray Istanbul; Israel, Elitzur Tel Aviv; Hungary, Tungsram Budapest; Poland, Lodski KS Lodz; Yugoslavia, Aida Jedenstvo Tuzla; Albania, Partizan Tirana; Slovakia, Slavia Banska Bistrica (Bodea et al., 2009).

The highest achievement of the Cluj players in the European competitions was qualifying for the quarter finals of the European Champions Cup in the 1985/1986 and 1986/1987 editions (Stănculescu, 1985b; Vasiliu, 1986b).

Coach of the national teams

Nicolae Martin was, on several occasions, coach of the youth or senior national teams. He prepared and led the senior women's national team of Romania at several editions of the Balkan Championships and European Championships. In 1983, together with George Chiraleu, he was the coach of the team that took part in the World University Games, held in Canada, and won the silver medals, achieving the best result of a Romanian team in an official, international competition (***, 1984).

In 1991, as a sign of recognition of his professional value and appreciation of his merits in developing basketball in our country, he was awarded the highest national distinction granted to sports experts, that of "antrenor emerit" [Coach Emeritus].

Instead of closing remarks

The coaching profession granted him the chance to come into contact with several generations of players, with

supporters of the teams that he trained, with professional colleagues, parents, sports managers and people in leadership positions at different levels. A man of common sense, accompanied by a solid education received in the family and perfected throughout his life, he gave everyone all due respect and honor, while trying always to live up to expectations.

He was a competent and demanding coach, a good organizer, but was also appreciated for his way of interacting with his collaborators and for the manner of rewarding the players for their work and results. He was admired and appreciated for the manner in which he knew how to blend work with recreation, when other traits of his personality became apparent: kindness, empathy, love of life. He was one of those coaches for whom the exercise of their profession meant an identification with the job and for whom the emotional background of their activity had special importance.

Through the way he lived his life and practiced his profession as a coach, Nicolae Martin blended his destiny with that of Cluj university women's basketball. For more than three decades, the period he served basketball as a coach, he offered us a living example of the meaning of vocation and professional value, and his achievements turned him into a symbol and granted him a special place among the great coaches of Cluj.

Conclusions

1. The quality of the training process, the results achieved with the teams he coached in the first years of his activity foretold his later great professional accomplishments.

2. In the years that he served as the head coach of the "Universitatea" Cluj-Napoca women's basketball team, the team achieved the greatest results in its history, ten national champion titles and other high rankings in internal competitions.

3. Under his leadership, the Cluj team participated in eight editions of the European Champions Cup and in one edition of the Liliana Ronchetti Cup. In the fifty-two matches played, it achieved thirty-three victories, defeating renowned teams, with impressive records: Minior Pernik, Ceramica Trevisio, Unimato Cesena, Stade Francaise Paris, Partizan Belgrade, Levski Spartak Sofia, Primigi Vicenza and Red Star Belgrade.

4. As a coach of the youth and senior national teams, he led them at the Balkan and European Championships. He was a member of the technical staff that provided the training of the student team that won the silver medals at the 1983 World University Games.

5. In 1991, as a sign of recognition of his professional value and appreciation of his merits in developing women's basketball in Romania, the Ministry of Youth and Sports granted him the title of Coach Emeritus following the recommendation of the Romanian Basketball Federation.

6. By his fruitful activity, he gave us a living example of the meaning of vocation and professional value, and due to his achievements Nicolae Martin became a symbol, which granted him a special place among the great coaches of Cluj.

Conflict of interests
Nothing to report.

Clarifications
This work is part of a series of articles related to the activity of Cluj sportsmen and coaches with great achievements.

References

Albulescu V. Baschet. Mică enciclopedie. Ed. Sport-Turism, Bucureşti, 1981:158-222.

Bodea G. et al."U" 90 de ani de activitate sportivă de performanţă. 1919-2009. Clubul Sportiv Universitatea Cluj, Cluj-Napoca, 2009:176-207.

Iovan P. Antiteza de la "U". Sportul, nr.10340, 9 martie 1983a: 2.

Iovan P. După meciul de ieri în CCE de baschet feminin, campioanele noastre îşi menţin şansele de calificare în semifinale. Sportul, nr. 11222, 17 ianuarie 1986:1.

Iovan P. S-a încheiat Divizia A de baschet feminin. "U" Cluj-Napoca, pentru a 10-a oară campioană. Sportul, nr. 1225, 22 mai 1989: 1.

Iovan P. Victorie în ultimul minut. "U" - Unimato Cesena 79 – 75. Sportul, nr. 10512, 29 septembrie 1983b:1.

Manasses I. Album foto. Universitatea CSS Viitorul Cluj-Napoca. 1986.

Martin N. Autobiografie. Clubul Sportiv Universitatea. Cluj-Napoca, 1972.

Merca-Bagiu M. Album foto. Universitatea Cluj-Napoca, Cluj-Napoca, 1982.

Paloşanu A (coord.), Bodea D, Cordoş N. "U" 75. Almanah aniversar. Pagini din istoria gloriosului club sportiv românesc transilvănean. Ed. Daco-Press, Cluj-Napoca, 1995,123-127.

Radu M. "U" Cluj-Napoca a obţinut o frumoasă victorie: 66-58 cu Ceramica Pegnosin Trevisio. Sportul, nr. 10005, 5 februarie 1982:1.

Radu M. Etajele unui "U" performant. Gazeta Sportuilor, anul VI, nr. 1209, 18 ianuarie 1994:3.

Stănculescu D. "U" Cluj-Napoca-din nou campioană. Sportul, nr. 1010, 31 mai 1982: 2.

Stănculescu D. "U" a îmbinat experienţa cu tinereţea. Sportul, nr. 10676, 10 aprilie 1984a:1.

Stănculescu D. Un frumos succes în CCE la baschet feminin. "U" Cluj-Napoca - Stade Francaise Paris 82 - 73 (31 - 29). Sportul, nr. 10850, 2 noiembrie 1984b:1.

Stănculescu D. Universitatea CSŞ Viitorul Cluj-Napoca pentru a patra oară campioană a ţării. Sportul, nr. 10980, 4 aprilie 1985a:1.

Stănculescu D. Calificare spectaculoasă în CCE de baschet (f) Universitatea Cluj-Napoca-Tungsram Budapesta 86-61. Sportul, nr. 11164, 8 noiembrie 1985b:1.

Stănculescu D. Succes de prestigiu în CCE la baschet feminin. Universitatea Cluj-Napoca a învins pe deţinătoarea trofeului, 76-72 ! Sportul, nr. 11228, 24 ianuarie 1986:1.

Stănculescu D. Cucerind al 8-lea titlu la baschet feminin, "U" menţine o frumoasă tradiţie. Sportul, nr. 11608, 18 aprilie 1987:1.

Stănculescu D. U-CSŞ Viitorul Cluj-Napoca, din nou campioană republicană. Sportul, nr. 11877, 11 februarie 1988:1.

Stănculescu D. "U" Cluj-Napoca a câştigat al 11-lea titlu. Gazeta Sporturilor, anul II, nr. 66 (serie nouă), 12 martie 1990:1.

Stănculescu D. Punct final în Campionatul Naţional feminin de baschet. Universitatea Cluj-Napoca - al XII-lea titlu. Gazeta Sporturilor, anul III, nr. 404 (serie nouă), 24 mai 1991:1.

Stănculescu D, Iovan P. Baschetbalistele de la "U" Cluj-Napoca, pentru a şaptea oară campioane ale ţării. Sportul, nr. 11342, 9 iunie 1986:1.

Vasilu A. Ieri în CCE la baschet feminin, "U" Cluj-Napoca- Partizan Belgrad 87 -71. Sportul, nr. 11216, 10 ianuarie 1986a: 1.

Vasiliu A. Calificare spectaculoasă: ”U” - KS Lodz 109-71. Sportul, nr. 11471, 7 noiembrie 1986b: 1.
***. Anuar sportiv universitar, 1983. Comisia Sport Turism al UASCR, București, 1984.
***. Anuar sportiv, 1981. Consiliul Național pentru Educație Fizică și Sport, București, 1981a.
***. Azi, premieră absolută pentru Cluj-Napoca: Universitatea-Sporting Atena, în cadrul CCE, la baschet. Sportul nr. 9911, 15 octombrie 1981b:1.
***. Baschet. Sportul Popular, 19 aprilie 1966: 3.
***. Buletin informativ nr. 3. Federația Română de Baschet, București, 1967.
***. Buletin informativ. Competiții, clasamente. Federația Română de Baschet, București, 1968.
***. Buletin informativ. Federația Română de Baschet, București, 1970.
***. Buletin informativ. Federația Română de Baschet, București, 1971.
***. Buletin informativ. Federația Română de Baschet, București, 1972a.
***. Buletin informativ. Federația Română de Baschet, București, 1991.
***. Enciclopedia educației fizice și sportului din România. Vol. I, Ed. Aramis, București, 2002,215.
***. Fuziunea între AS Armata și Universitatea Cluj-Napoca, Sportul, nr. 7181, 20 septembrie 1972b:3.
***. În CCE la baschet feminin. ”U” Cluj-Napoca a câștigat la Belgrad, dar ... Sportul, nr. 11235, 1 februarie 1986: 4.
***. Kosárlabda, Fáklya, kedd, september 3 Nagyvárad, 1963:3.
***. S-a încheiat Campionatul Republican de Baschet, divizia A, seria a II-a. Crișana, Oradea, 16 mai 1965:3.
***. Victorie după un meci captivant: ”U” Cluj-Napoca-Minior Pernik 90-88, Sportul, nr. 9966,17 decembrie 1981c: 4.

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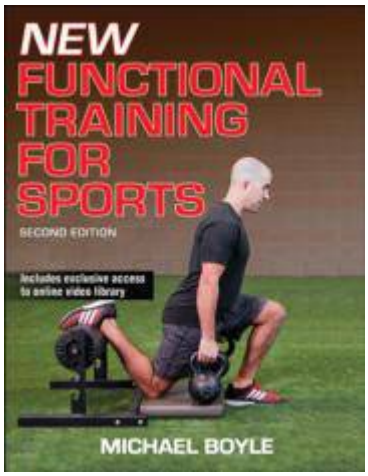
RECENT PUBLICATIONS
ACTUALITĂŢI EDITORIALE

Book reviews
Recenzii cărţi

New functional training for sports - 2nd edition
(Noul antrenament funcţional în sport - ediţia a 2-a)
Author: Michael Boyle
Publishing House: Human Kinetics, 2016
256 pages; Price: £17.99



The type of sports training to which this book is dedicated has its origin in rehabilitation, an area in which more than two decades ago, as a reaction to the increasingly oppressing dominance of sophisticated equipment – allowing the analytical work of muscle groups –, the need and concern for more functional training appeared. That is training based on and practising usual, natural movements; those movements that individuals in general and athletes in particular perform during their current or specific activities. This means that functional training had to try to adapt and develop exercises facilitating the execution of tasks, under conditions of maximum efficiency and minimum injury risk.

During the course of time and during the application and improvement of functional sports training, some controversies occurred between purist supporters of the method and practitioners, trainers and athletes. These controversies were generated by the fact that function varies from one joint to another and consequently, exercises that promote joint function requiring stabilization/stability must differ from those intended for joints that must be essentially mobile. Unfortunately, to date, controversies and differences in visions have not completely disappeared, so that in a recent material entitled ”What is functional training”, the author of the present book finds it necessary to draw particular attention to the 3 key muscle groups, which should necessarily benefit from very complete and consistent ”stabilization” training: deep abdominal muscles (transverse abdominal and internal oblique muscles), hip abductors and rotators, and scapular stabilizers. However, beyond the mentioned as well as other controversies on which we do not find it necessary to insist here, functional training in sport is undeniably a very topical subject ”in fashion”, which is also proved by the fact that Human Kinetics alone published this year two books dedicated to it *.

Being at its second edition, the book that we present to our readers was obviously preceded by another one, published 12 years ago. Meanwhile, not only the author’s personal experience has considerably extended, but the general knowledge in this area has also reached a higher level of development and scientific support. Happily combining these two perspectives, Michael Boyle now offers an up-to-date book, which can represent a valid professional information source for the next decade, not only from a theoretical but also from a practical point of view, given that the text, written as explicitly as possible, is accompanied and complemented by color photo sequences and video demonstrations illustrating complex exercises.

The material provided by the author in 11 chapters presents us the concepts, methods, exercises and programs that will lead to the obtaining of maximum performance in sports competitions, and the series of functional evaluation/testing techniques available will prove priceless for the design of a perfectly individualized functional training plan, taking into consideration the requirements of the particular sports discipline, as well as the particularities of the athlete concerned.

The beginning chapter refers to the need for ”more functional” training and its qualities, and argues why functional training, its content and principles would be somewhat more adequately designated by the term *general sports training* than by *specific sports training*. This evidences the particularity of the vision that underlies functional training; the fact that this method is rather concerned with what is common to all or the majority of sports. This does not mean, however, that functional training does not take into consideration the requirements of the sport concerned, which is demonstrated by the title and content of the second chapter: ”Analyzing the demands of your sport”. ”Assessing your functional strength”, the title of the third chapter, is essential for the functional training program, which is addressed in the fourth chapter. The next six chapters detail specific aspects (from the perspective of functional training) related to the use of foam rollers, stretching and dynamic warm-up (chapter 5), and the training of the lower body (chapter 6), torso (chapter 7) and upper body (chapter 8). The two other chapters of this book

are dedicated to plyometric training (chapter 9) and Olympic weightlifting (chapter 10). The book concludes with a section (chapter 11) dealing exclusively with a consistent number of "Performance enhancement programs".

Written by an accomplished practitioner in the field, who has trained elite athletes and teams in various disciplines (some of these winning medals including at the Olympic Games), and who also has the advantage of not being at his first attempt in this area, the book that we strongly and responsibly recommend would be welcome on the bookshelves of all those whose activity is aimed at improving speed, strength and power in sport, while minimizing injuries caused by training or competitions.

* The other book belongs to Juan Carlos "JC" Santana and is entitled *Functional training. Exercises and programming for training & performance.*

* * *

Tipul de pregătire sportivă căruia îi este dedicată cartea pe care o prezentăm de data aceasta, îşi are originea în reabilitare. Domeniu în care, cu peste două decenii în urmă şi ca reacţie la dominaţia tot mai sufocantă a aparatelor sofisticate – cu ajutorul cărora grupele de muşchi „se lucrează" analitic – a apărut necesitatea şi preocuparea pentru un antrenament mai funcţional. Adică un antrenament care să se bazeze pe, şi să exerseze mişcările uzuale, naturale; acele mişcări pe care indivizii în general şi sportivii în particular le execută în activităţile lor curente, respectiv specifice. Asta însemnând că antrenamentul funcţional trebuia să încerce să adapteze şi să dezvolte/ conceapă exerciţii, care să le permită celor ce-l adoptă să execute mai uşor sarcinile pe care le au de îndeplinit, în condiţiile maximei eficienţe şi ale unui risc minim de accidentare.

În decursul timpului şi al aplicării şi perfecţionării antrenamentului funcţional în sport, au apărut şi unele controverse între promotorii „purişti" ai metodei şi practicienii domeniului, antrenori şi sportivi. Controverse generate de faptul că funcţia variază de la o articulaţie la alta şi, drept urmare, exerciţiile care promovează funcţia articulaţiilor ce necesită stabilizare/stabilitate trebuie să difere de cele ce vizează articulaţiile care trebuie să exceleze în mobilitate. Din păcate nici azi controversele şi diferenţele de viziune respective nu au dispărut complet, astfel încât într-un material recent, intitulat „Ce este antrenamentul funcţional", autorul prezentei cărţi găseşte de cuviinţă să atragă în mod special atenţia asupra celor 3 grupe musculare cheie, care trebuie neapărat să beneficieze de un antrenament foarte complet şi consecvent „de stabilizare": abdominalii profunzi (abdominalul transvers şi oblicul intern), abductorii şi rotatorii şoldului şi stabilizatorii scapulei. Dincolo însă de controversele amintite, dar şi de altele asupra cărora considerăm că nu este cazul să insistăm aici, este un lucru de netăgăduit că antrenamentul funcţional în sport reprezintă un subiect foarte actual, „la modă", lucru probat inclusiv de faptul că numai la Human Kinetics au apărut anul acesta două cărţi care îi sunt dedicate *.

Aflându-se la a doua ediţie, cartea pe care o semnalăm cititorilor noştri este bineînţeles precedată de o alta, apărută cu 12 ani în urmă. Între timp, desigur, nu numai experienţa personală a autorului s-a îmbogăţit notabil, ci şi cunoştinţele domeniului în general au atins un alt nivel de dezvoltare şi susţinere ştiinţifică. Îmbinând într-un mod fericit aceste două perspective, Michael Boyle ne oferă acum o lucrare „la zi", care poate constitui o sursă de informare profesională valabilă pentru următorul deceniu. Şi asta nu numai din punc de vedere teoretic, ci şi practic, atâta vreme cât textul, redactat într-un mod cât se poate de explicit, este însoţit şi completat de secvenţe foto color, şi de demonstraţii video ce ilustrează exerciţiile complexe.

Materialul livrat de autor în 11 capitole, ne prezintă conceptele, metodele, exerciţiile şi programele care vor conduce la obţinerea de performanţe maxime în competiţiile sportive, iar seria de tehnici de evaluare/testare funcţională pusă la dispoziţie, se va dovedi de nepreţuit pentru conceperea unui plan perfect individualizat de antrenare funcţională, care să ţină cont şi de cerinţele disciplinei sportive, dar şi de particularităţile sportivului în cauză.

Capitolul de debut se referă la necesitatea dar şi la atributele unui antrenament „mai funcţional", şi argumentează de ce antrenamentul funcţional, conţinutul şi principiile acestuia, ar fi ceva mai adecvat desemnate prin termenul *antrenament sportiv general,* decât prin acela de *antrenament sportiv specific*. Prin aceasta scoţându-se în evidenţă particularitatea viziunii ce stă la baza antrenamentului funcţional; faptul că această metodă se preocupă mai curând de ceea ce este comun tuturor sau majorităţii sporturilor. Ceea ce nu înseamnă, totuşi, că antrenamentul funcţional nu ţine cont şi de cerinţele sportului în cauză, lucru dovedit de însuşi titlul şi conţinutul celui de-al 2-lea capitol: „Analiza cerinţelor sportului". Esenţială este însă „Evaluarea forţei funcţionale", titlul celui de-al 3-lea capitol, fără de care nu se poate concepe programul de antrenament funcţional, demers de care se ocupă al 4-lea capitol. Următoarele şase capitole detaliază aspecte specifice (din perspectiva antrenamentului funcţional, adică) legate de rularea pe suluri de spumă, stretching şi încălzirea dinamică (cap. 5), şi de antrenarea trenului inferior (cap. 6), a trunchiului (cap. 7) şi a trenului superior (cap. 8). Celelalte două capitole ale acestui calup fiind dedicate antrenamentului pliometric (cap. 9), respectiv ridicării de greutăţi în stilul olimpic (cap. 10). Cartea încheindu-se cu o secţiune (cap.1 1) alocată exclusiv unui număr consistent de „Programe de antrenament de performanţă".

Scrisă de un practician desăvârşit în domeniu, care, de-a lungul anilor a antrenat sportivi şi echipe de marcă din diverse discipline (unii dintre aceştia obţinând medalii inclusiv la Jocurile Olimpice), şi care în acelaşi timp are şi avantajul de a nu fi la prima încercare pe tărâmul respectiv, cartea pe care o recomandăm cu toată căldura şi responsabilitatea ar fi binevenită în biblioteca tuturor celor a căror activitate are drept obiectiv îmbunătăţirea vitezei, forţei şi puterii în sport, în condiţiile reducerii la minimum a apariţiei de accidente generate de antrenamente sau competiţii.

* Cealaltă lucrare îi aparţine lui Juan Carlos „JC" Santana şi se intitulează *Functional training. Exercises and programming for training & performance.*

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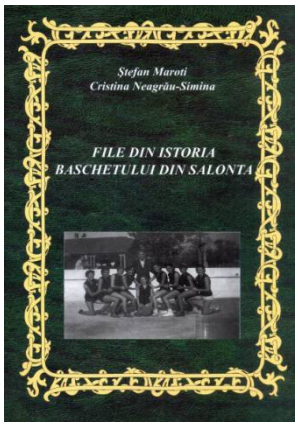
Pages of history of Salonta basketball
(File din istoria baschetului salontan)
Authors: Ştefan Maroti, Cristina Neagrău-Simina
Publishing House: Prolog, Oradea
152 pages



At the beginning of June, it was brought to our attention that on 28 May 2016, in the presence of a numerous audience, a new monograph was launched: *Pages of history of Salonta basketball*. The authors, Ștefan Maroti and Cristina Neagrău-Simina, based on an extensive and complex documentation from a large number of sources (archive documents, newspaper articles, encyclopedias, statistics, photo albums, discussions with witnesses of events, etc.) referring to the studied topic, present the history of more than seven decades of basketball in Salonta, offering an extensive image of the evolution of this team sports game in this city.

The authors' intention was to bring to life in the minds and souls of the lovers of this sport events related to the history of Salonta basketball, to present the results obtained by athletes, coaches, sport leaders and all those who have contributed during the course of time to the development of this sport. In this way, the authors succeeded through their approach in paying homage to those whose names were linked in a form or another to the achievements of the basketball teams in Salonta. The over one hundred and fifty pages and the many illustrations successfully allow through their content to bring home and renew the friendship between those connected by thousands of invisible threads in their passion for this sport, in the service of Salonta basketball. The bridge between generations who love this sport discipline is not without importance.

Reading this book provides an opportunity to relive or learn about events or persons who wrote the history of more than 70 years of this sport in Salonta.

Through the rigorous documentation and the way of presentation of data, the book is a useful document for those who study or wish to better know this segment of sports history in the city of Salonta. Also, the volume induces the idea that basketball, as part of the sports phenomenon, is a component of the past of Salonta, that its achievements are part of the city's heritage. Moreover, for most of the inhabitants of Salonta, basketball, its results, its contribution to the development of the city are points of pride.

* * *

La începutul lunii iunie ne-a fost semnalat că, la 28 mai 2016, în prezența unei numeroase asistențe, a avut loc lansarea unei noi lucrări cu caracter monografic: File din istoria baschetului salontan. Autorii, Ștefan Maroti și Cristina Neagrău-Simina, pe baza unei vaste și complexe documentări, realizate în urma consultării unui mare număr de surse (documente de arhivă, articole de presă, enciclopedii, statistici, albume cu fotografii, discuții cu persoane care au trait aceste evenimente etc.) care se referă la tema studiată, prezintă istoria de mai bine de șapte decenii a baschetului salontan, oferind o imagine cuprinzătoare a evoluției acestui joc sportiv de echipă în localitate.

Intenția autorilor a fost aceea de a reînvia în mintea și sufletele iubitorilor acestui sport a evenimentelor legate de istoria baschetului salontan, prezentarea rezultatelor obținute, a sportivilor, antrenorilor, conducătorilor sportivi și a tuturor celor care au contribuit, de-a lungul timpului, la dezvoltarea acestui sport. În acest fel, autorii au reușit ca, prin demersul lor, să aducă un omagiu celor al căror nume s-a alăturat, într-o formă sau alta, de realizările echipelor de baschet din localitate. Cele peste o sută cincizeci de pagini și numeroasele ilustrații, prin conținutul lor, izbutesc, în mod fericit, să readucă la vatră și să reînoade relațiile de camaraderie între cei legați prin mii de fire nevăzute în pasiunea pentru acest sport și servirea baschetului în Salonta. Nu lipsită de importanță este puntea de legătură realizată între generațile care iubesc această disciplină sportivă.

Lectura cărții oferă prilejul retrăirii, pentru unii, și a cunoașterii, pentru alții, a unor evenimente, a unor persoane care au scris istoria de peste șaptezeci de ani a acestui sport pe meleagurile salontane.

Prin rigurozitatea documentării și modul de prezentare a datelor, cartea este un document util pentru cei care studiază sau vor să cunoască mai bine acest segment al istoriei sportului din localitate. În aceiași măsură, volumul induce ideea că baschetul, ca parte a fenomenului sportiv, este o componentă a trecutului Salontei, că realizările sale fac parte din patrimoniul localității. Mai mult, pentru majoritatea locuitorilor orașului, baschetul, rezultatele sale, contribuția sa la dezvoltarea urbei constituie prilej de mândrie.

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SCIENTIFIC MEETINGS
MANIFESTĂRI ŞTIINŢIFICE

The 25th Anniversary National Meeting of History of Pharmacy Cluj, 30 June - 2 July 2016
A XXV-a Reuniune Naţională Aniversară de Istoria Farmaciei Cluj, 30 iunie - 2 iulie 2016

Founded in Bucharest, through the efforts of Col. (r.) Dr. Pharm. Constantin Iugulescu (1924-2006) and Prof. Dr. Marţian Cotrău (1923-1998), the Romanian Society of the History of Pharmacy (SRIF) started its activity in 1991, with the two founders being elected Secretary General - the first, and President - the second.

SRIF, whose President is currently Assoc. Prof. Dr. Adriana Elena Tăerel, organized on 30 June -2 July 2016, in Cluj, the 25th National Meeting and celebrated a quarter of a century of activity.

The Faculty of Pharmacy of "Iuliu Haţieganu" University of Medicine and Pharmacy (UMPh) and the College of Pharmacists of Cluj county were also organizers.

The sessions for the 68 scientific papers in the program of the Meeting, including 32 oral presentations and 36 posters, were held in the "Teodor Goina" amphitheater of the new UMPh building on Dr. Gheorghe Marinescu street No. 23. The fact that the name of the new amphitheater recalls Prof. Dr. Doc. Teodor Goina (1896-1985), the founder of pharmacognosy in Romanian higher education in Cluj, was a happy coincidence for the Meeting.

The festive opening of the Meeting took place in the presence of 97 participants and guests, among which members of the Romanian Academy of Medical Sciences, the International Academy of the History of Pharmacy, members of honor of SRIF, university staff of all academic ranks, doctors in the history of pharmacy, pharmacists, etc.

The following attended and contributed papers to the Meeting: Dr. Pharm. Ovidiu Maior (Saarbrücken), Prof. Dr. Leontina Kerničan (Faculty of Pharmacy in Belgrade), Elena Chiţan (Faculty of Pharmacy in Chişinău), etc.

The 32 oral presentations were scheduled in four sessions.

A number of papers stood out, which presented the life and work of some personalities of the history of pharmacy: Prof. Dr. Doc. Valeriu Lucian Bologa (1892-1971), Prof. Dr. Marţian Cotrău, Dr. Pharm. Constantin Iugulescu, Prof. Dr. Emanoil Grigorescu (1923-2016), as well as personalities of pharmacy as a profession: Constantin Popescu Delagreaca (1922-1976), etc.

The presentations entitled *The Romanian Society of the History of Pharmacy - 25 years of activity (1991-2016), Landmarks of the activity of SRIF, the Iaşi branch (2002-2015),* as well as *Two decades of Moldovan-Romanian collaboration within SRIF,* were real comprehensive activity reports.

An important objective of the General Assembly of SRIF members was the proposal made by Assist. Prof. Dr. Pharm. Daniela Benedec for the creation of the Cluj SRIF branch, in order to promote the Transylvanian medico-pharmaceutical history and the local personalities who have contributed to the knowledge of the history of pharmacy. Of equal importance was the proposal made by Dr. Pharm. Ştefan Budaházy to approve Oradea as the location of the 26th National Meeting of History of Pharmacy.

The actions recommended by the organizers for the knowledge of historical Cluj included a visit to the Museum of the History of Pharmacy (Piaţa Unirii No. 28), which preserves the collection of Prof. Dr. Iuliu Orient (1869-1940) in the oldest city pharmacy in Cluj, whose existence was documented in the 16th century and which became a museum in 1954, through the efforts of Prof. Dr. Valeriu Lucian Bologa.

The four sessions of presentations were followed by the conferences of *Plantextrakt* Cluj and *Tis Farmaceutic* Bucharest, having as a main objective the presentation of new nutritive supplements to use in phytotherapy, including sportsmen therapy (e.g. with vitamins, minerals, antioxidants, Spirulina, extracts of *Arnica montana* and *Hippophaë rhamnoides*, foot care products, venotonic preparations, etc.), sponsors of the Meeting along with the Colleges of Pharmacists of *Cluj, Bihor, Sibiu, Satu-Mare*

counties, the pharmacies Rodia Oradea, Remedium Farm Cluj, Ducfarm Cluj, the companies *Farmec Cluj, Fares Orăştie, Alis Holidays Cluj, Rondocarton Cluj, Marty Restaurant Cluj* and *Sarea-n Bucate Turda,* as well as Prof. Dr. Marius Bojiţă and Assoc. Prof. Dr. Lorena Filip, who are kindly thanked for their support, altruism and dedication.

Given the anniversary nature of the event, the family members of Col. Dr. Pharm. C. Iugulescu founded the *Constantin Iugulescu Award,* dedicated to the recognition and encouragement of young researchers in the history of pharmacy. Thus, three prizes worth 500 Euro each were granted and handed out. The day of 2 July 2016 closed the 25th National Meeting of History of Pharmacy with the *Forum of Young Researchers*, where the three prize-winning papers were presented: *Historical medico-pharmaceutical documents found in the personal archive of Prof. Dr. Mihail Şcheau* (by Laura Nicolae), *The pre-pharmaceutical military period until 1831* (by Cristina Enculescu, Adriana Elena Tăerel), and *Two decades of Moldovan-Romanian collaboration within SRIF* (by Elena Chiţanu, Tatiana Şchiopu, Elena Zgîrcu, Stela Adauji, Liliana Dogotari, Svetlana Şcetinina, Anatolii Peschin, Mihail Brumărel, Vladimir Safta).

The participants were offered the volume with the full-text papers, entitled *The 25th Anniversary National Meeting of History of Pharmacy*, 392 pp., published by the SITECH Publishing House Craiova, editor Assoc. Prof. Dr. George-Dan Mogoşanu, as well as a welcome cocktail and a festive dinner, and during the breaks following each session, visits of tourist attractions in Cluj were organized for the guests.

With several conclusions on the success of the Meeting proceedings and the time spent among colleagues, the President, Assoc. Prof. Dr. Adriana Elena Tăerel, closed the Meeting proceedings and handed out diplomas to all participants.

* * *

Înfiinţată la Bucureşti, prin străduinţele Col. (r.) Dr. Farm. Constantin Iugulescu (1924-2006) şi Prof. univ. Dr. Marţian Cotrău (1923-1998), Societatea Română de Istoria Farmaciei (SRIF) şi-a început activitatea în anul 1991, alegând în conducere pe cei doi ctitori, primul ca Secretar General, al doilea ca Preşedinte.

SRIF, al cărui Preşedinte este acum Conf. Dr. Adriana Elena Tăerel, a organizat în zilele 30 iunie – 2 iulie 2016, la Cluj, a XXV-a Reuniune Naţională şi a aniversat un sfert de secol de activitate.

Facultatea de Farmacie din Universitatea de Medicină şi Farmacie „Iuliu Haţieganu" (UMF) şi Colegiul Farmaciştilor din Judeţul Cluj au fost, de asemenea, organizatori.

Cele 68 de lucrări ştiinţifice din programul Reuniunii, 32 comunicări şi 36 postere, s-au ţinut în amfiteatrul „Teodor Goina" din clădirea nouă a UMF de pe str. Dr. Gheorghe Marinescu nr. 23. Pentru Reuniune a fost o coincidenţă fericită faptul că numele noului amfiteatru îl aminteşte pe Prof. Dr. Doc. Teodor Goina (1896-1985), întemeietorul farmacognoziei în învăţământul superior românesc din Cluj.

Deschiderea Reuniunii s-a făcut în cadru festiv, în prezenţa a 97 participanţi şi invitaţi, între care membri ai Academiei de Ştiinţe Medicale din România, ai Academiei Internaţionale de Istoria Farmaciei, membri de onoare ai SRIF, profesori universitari de toate gradele, doctori în Istoria farmaciei, farmacişti etc.

Au fost prezenţi şi au contribuit cu lucrări, Dr. Farm. Ovidiu Maior (Saarbrücken), Prof Dr. Leontina Kerničan (Facultatea de Farmacie din Belgrad), Elena Chiţan (Facultatea de Farmacie din Chişinău) ş. a.

Prezentarea celor 32 de comunicări orale s-a programat în patru sesiuni.

Remarcabile au fost câteva comunicări care au prezentat vieţile şi operele unor somităţi ale istoriei farmaciei: Prof. Dr. Doc. Valeriu Lucian Bologa (1892-1971), Prof. Dr. Marţian Cotrău, Dr. Farm. Constantin Iugulescu, Prof. Dr. Emanoil Grigorescu (1923-2016), personalităţi ale farmaciei ca profesie: Constantin Popescu Delagreaca (1922-1976) etc.

Comunicările intitulate *Societatea Română de Istoria Farmaciei - 25 de ani de activitate (1991-2016), Repere din activitatea SRIF Secţia Iaşi (2002-2015),* precum şi *Două decenii de colaborare în cadrul SRIF Moldova – România,* au fost cuprinzătoare, ca adevărate rapoarte de activitate.

Un obiectiv important al Adunării Generale a membrilor SRIF a fost propunerea făcută de Şef lucr. Dr. Farm. Daniela Benedec, de înfiinţare a Secţiei SRIF Cluj, în vederea promovării istoriei medico-farmaceutice transilvănene şi a personalităţilor locale care au contribuit la cunoaşterea Istoriei Farmaciei. La fel de importantă a fost propunerea făcută de Dr. Farm. Ştefan Budaházy, de a se aproba Oradea ca locaţie pentru cea de a XXVI-a Reuniune Naţională de Istoria Farmaciei.

Printre acţiunile recomandate de organizatori pentru cunoaşterea Clujului istoric s-a numărat vizita la Muzeul de Istoria Farmaciei (Piaţa Unirii nr. 28), care conservă Colecţia Prof. Dr. Iuliu Orient (1869-1940), în cea mai veche farmacie orăşenească din Cluj, atestată documentar în secolul al XVI-lea şi transformată în muzeu în 1954, prin grija Prof. Dr. Valeriu Lucian Bologa.

După cele patru sesiuni de comunicări, au fost prezentate conferinţele *Plantextrakt* Cluj şi *Tis Farmaceutic* Bucureşti, având ca obiectiv principal prezentarea unor noi suplimente nutritive cu utilizare în fitoterapie, inclusiv în terapia sportivilor (de exemplu: vitamine, minerale, antioxidanţi, spirulina, extracte de *Arnica montana* şi *Hippophaë rhamnoides*, produse pentru îngrijirea picioarelor, preparate venotonice etc), sponsorii Reuniunii cărora li s-au alăturat *Colegiile Farmaciştilor Cluj, Bihor, Sibiu, Satu-Mare, Farmaciile Rodia Oradea, Remedium Farm Cluj, Ducfarm Cluj,* Firmele *Farmec Cluj, Fares Orăştie, Alis Holidays Cluj, Rondocarton Cluj, Marty Restaurant Cluj* şi *Sarea-n Bucate Turda,* care sunt rugaţi să primească mulţumiri, ca şi Dn. Prof. Dr. Marius Bojiţă şi Conf. Dr. Lorena Filip, pentru sprijin, altruism şi dăruire.

Dat fiind caracterul aniversar al evenimentului, membrii Familiei Col. Dr. Farm. C. Iugulescu au înfiinţat *Premiul Constantin Iugulescu,* dedicat recunoaşterii şi stimulării tinerilor cercetători în domeniul Istoriei Farmaciei. Astfel s-au acordat şi înmânat trei premii a câte 500

euro fiecare. Iar ziua de 2 iulie 2016 a încheiat a XXV-a Reuniune Naţională de Istoria Farmaciei, cu *Forumul Tinerilor Cercetători*, în care au fost prezentate cele trei lucrări premiate: *Documente istorice medico-farmaceutice regăsite în arhiva personală a Prof. Dr. Mihail Şcheau* (de Laura Nicolae), *Perioada prefarmaceutică militară până la 1831* (de Cristina Enculescu, Adriana Elena Tăerel) şi *Două decenii de colaborare în cadrul SRIF: Moldova - România* (de Elena Chiţanu, Tatiana Şchiopu, Elena Zgîrcu, Stela Adauji, Liliana Dogotari, Svetlana Şcetinina, Anatolii Peschin, Mihail Brumărel, Vladimir Safta).

Participanţilor la comunicări li s-au oferit volumul cu lucrările *in extenso,* intitulat *A XXV-a Reuniune Naţională Aniversară de Istoria Farmaciei,* 392 p., apărut la Ed. SITECH Craiova, sub îngrijirea Conf. Dr. George-Dan Mogoşanu, Cocteilul de primire şi Cina festivă, iar în pauzele de după fiecare sesiune, s-a organizat pentru oaspeţi vizitarea câtorva obiective turistice din Cluj.

Cu câteva concluzii asupra reuşitei lucrărilor şi a colegialei petreceri împreună, D-na Preşedinte, Conf. Dr. Adriana Elena Tăerel a încheiat lucrările Reuniunii şi a înmânat tuturor Diplomele de participare.

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EVENTS
EVENIMENTE

The Rugby Player monument in Cluj-Napoca
Monumentul rugbistului la Cluj-Napoca

On Friday 22 June, at 11.00 a.m., the *Rugby Player monument* was unveiled in the *"Iuliu Haţieganu" Sports Park*. The event took place on the 66th anniversary of rugby activity in Cluj-Napoca. With this statue, Cluj joins the stadiums and rugby grounds that pay homage to rugby personalities, of which we mention: Wembley Stadium, Ispswich, Edinburgh, Warrington (England), Tokyo, Liverpool.

At the time of the unveiling, personalities from Cluj universities delivered short speeches related to the event. Former and current players, fans of Cluj rugby, coaches, referees, presidents of sections, and public participated to the unveiling.

The sculptor Liviu Mocan explained the symbols of his creation. He chose a phase of recovery of the ball from touch, considering that among the defining elements of rugby: scrum, back pass, running with the ball at the chest, try, etc., this represents elevation towards superior levels, aspiration towards the high spheres of individual and collective energies. The base of the statue is made of granite, symbolizing the strength and endurance of the team. The statue is made of stainless steel, symbolizing power, energy, friendship, fair play as an indestructible whole. At the top, the oval ball with a flame in the center symbolizes the superb madness of the game, the energy and fire of the rugby player's heart. Rugby is the only sport in which players run with the ball close to their hearts.

The principal donor was Remus Pop (the *Mongol*), a well-known name in the artistic and sports world, a long-time philanthropist of Cluj culture and sport.

Dan Draghiciu
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Inauguration time (from left to right): Adrian Popescu - poet, Liviu Mocan - sculptor, Pavel Şuşară - art critic, Prof. PhD. Emil Burzo - member of the Romanian Academy, Prof. PhD. Ioan Bolovan, Prof. PhD. Radu Munteanu.

The Rugby Player monument.

Group photo of veterans, after the unveiling.

A hard core, detached from the *scrum.* The forth from left, Petrică Motrescu/wing three-quarter.

The annual meeting of veteran athletes of the „U" Cluj Club (22)
Întâlnirea anuală a atleţilor veterani de la „U" Cluj (22)

The annual meetings of veteran athletes of the "U" Cluj Club were initiated 22 years ago, in 1995, after the 75th anniversary of the foundation of the club, in 1994.

The 22nd "episode" of the already traditional meeting took place on Saturday 3 September 2016. The landmark of the meeting was, like in the previous years, the monument at the entrance of the athletics field, raised to honor the memory of Ioan Arnăut and Ion Moina. We mention that the monument will undergo a slight embellishment; it will be elevated and surrounded by pillars. The facelift of the monument will be the occasion for a future festive meeting of veteran athletes in Cluj, announced for Saturday 2 September 2017, where local officials including the Mayor Emil Boc are expected to come.

The star of the event was Alexandra Taifas Sicoe, a huge name of Romanian athletics, multiple National Champion (27), participant in the Helsinki OG in 1952, now at the venerable age of 84.

The participants in this year's meeting include Mircea Pop, Virgil Grobei, Ilarie Măgdaş, Vasile Bogdan, Mircea Alexei, Traian Bocu, Dumitru Oltean, Gheorghe Monea, Cruciţa Călugăr, Ilona Szekely, Mariana Nedelcu-Simplăcean, Valeria Ţigănilă-Bogdan, Mioara Cornea-Bodea, Tuka Laszlo, Vasile Sărucan, Draga Comşa-Crişan, Agepsina Rusu, Maria Marta, Iulia Popa, Ioana Ciupei-Dobrău.

An important contribution to the organization and success of the event was brought by the "U" Club's President, Eng. Ovidiu Vasu.

Traian Bocu
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The usual group photo at 10 o'clock, the year of grace 2016.

Four of the champions of the years 1952-1955 - veterans Alexandra Taifas Sicoe, Mircea Pop, Virgil Grobei and Ilarie Măgdaş.

Alexandra Taifas Sicoe, in front of the monument in the memory of Ioan Arnăut and Ion Moina, which will be elevated next year.

Four of the *young veterans*: Mioara Cornea-Bodea, Mariana Nedelcu-Simplăcean, Draga Comşa-Crişan, Agepsina Rusu.

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.

FOR THE ATTENTION OF THE SPONSORS

Requests for advertising space should be sent to the Editors of the "Palestrica of the Third Millennium" journal, 1, Clinicilor St., 400006, Cluj-Napoca, Romania. The price of an A4 full colour page of advertising for 2012 will be EUR 250 and EUR 800 for an advert in all 4 issues. The costs of publication of a logo on the cover will be determined according to its size. Payment should be made to the Romanian Medical Society of Physical Education and Sports, CIF 26198743. Banca Transilvania, Cluj branch, IBAN: RO32 BTRL 0130 1205 S623 12XX (RON).

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Payment of subscriptions should be made by bank transfer to the Romanian Medical Society of Physical Education and Sports, CIF 26198743. Banca Transilvania, Cluj branch, IBAN: RO32 BTRL 0130 1205 S623 12XX (RON), RO07 BTRL 01,304,205 S623 12XX (EUR), RO56 BTRL 01,302,205 S623 12XX (USD). SWIFT: BTRLRO 22

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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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

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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.