PALESTRICA OF THE THIRD MILLENNIUM - CIVILIZATION AND SPORT

A quarterly of multidisciplinary study and research

© Published by The "Iuliu Haţieganu" University of Medicine and Pharmacy of Cluj-Napoca
and
The Romanian Medical Society of Physical Education and Sports
in collaboration with
The Cluj County School Inspectorate

A journal rated B+ by CNCS (Romanian National Research Council) since 2007,
certified by CMR (Romanian College of Physicians) since 2003
and CFR (Romanian College of Pharmacists) since 2015

A journal with a multidisciplinary approach in the fields of biomedical science,
health, medical rehabilitation, physical exercise, social sciences
applied to physical education and sports activities

A journal indexed in international databases:
EBSCO, Academic Search Complete, USA;
Index Copernicus, Journals Master List, Poland;
DOAJ (Directory of Open Access Journals), Sweden
CiteFactor, Canada/USA

4

Vol. 17, No. 4, October-December 2016

Palestrica of the third millennium – Civilization and sport
Palestrica Mileniului III – Civilizație și Sport
Vol. 17, no. 4, October-December 2016

Editorial Board
Comitetul editorial

Editorial Office of the Journal of
„Palestrica of the Third Millennium”
Civilization and Sport
Street: Clinicilor no. 1
400006, Cluj-Napoca
Telephone: 0264-598575
E-mail: palestrica@gmail.com

pISSN 1582-1943
eISSN 2247-7322
ISSN-L 1582-1943
www.pm3.ro

Editors for English Language
Sally Wood-Lamont *swood@umfcluj.ro*
Denisa Marineanu *margitana@yahoo.com*

Marketing, PR
Cristian Potora *cristipotora@gmail.com*

International relations
Tudor Mîrza *midor1967@gmail.com*
Irina Chiș *irinnaus@yahoo.com*
Mihai Kiss *mishu71@yahoo.com*
Cornelia Popovici *popovicicornelia@yahoo.com*

Website maintenance
Transmondo

Contents

Cuprins

Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 4, October-December 2016, 257–260

EDITORIAL

The importance of evidence use in health-enhancing physical activity promotion policies in Romania - The REPOPA Project

Importanța dovezilor în politicile de promovare a activității fizice pentru sănătate în România - Proiectul REPOPA

Sandu Petru
National Institute of Public Health, Regional Public Health Center Cluj, Health Promotion and Health Evaluation Section – Specialist medical doctor in public health and management
Babes-Bolyai University, Faculty of Political, Administrative and Communication Sciences, Department of Public Health – Associated researcher
petru.sandu@publichealth.ro

Health-enhancing physical activity (HEPA) promotion amongst populations has been identified at international level as one of the key factors in the efforts to stop or at least limit the obesity epidemic affecting most nations worldwide (I-Min et al., 2012).

However, for achieving sustainable HEPA promotion processes, effective evidence-informed intersectoral policies (by evidence we understand research evidence as well as other types of evidence such as specialist experience and expertise, information from target groups, etc.), comprising aspects regarding efficacy and medium- and long-term population impact are needed (Edwards & Tsouros, 2006).

A relevant example in this respect is represented by HEPA promotion policies amongst children and adolescents. Although the most recent scientific literature suggests that intersectoral (education, sport and health sectors) and multi-level (school based but also home and community based) interventions are much more effective in the long run in changing children's behavior, in making them more physically active (1), these types of approaches are non-existent in Romania and are somewhat scarce in other European countries. Although the scientific literature acknowledges the importance of physical activity for health (Dumitru, 2016), there are currently no "real" national strategies, policies and programs to validate this evidence, despite the recommendations and the financial and logistic support provided at European level through programs such as Erasmus + Sport (2).

Moreover, although the use of evidence in HEPA promotion amongst children and adolescents is strongly suggested in the scientific literature, with the purpose of adapting these interventions to the potential, needs and preferences of the target groups (3), most of the times these interventions stimulate and engage children who already have medium to high levels of physical activity, good motor skills and an interest in practicing physical activity, thus increasing the gap between these active children and the grand proportion of sedentary children. In this context, we can give the example of sport competitions organized in the school environment. The school teams participating in these competitions are formed by the most physically gifted and fit students, although the main objective of these competitions is not - or at least should not be - sports performance, but rather mere exercise, HEPA, practiced by as many students as possible.

These practices are a reflection of the vision and expertise of practitioners in the field, of physical education and sport (PES) teachers, whose professional training is strongly embedded in the field of sport, which limits their understanding of the importance of HEPA and their capacity to promote it among as many school-aged children as possible. Thus, cross-sectoral collaboration (physicians and PES teachers) is very important for HEPA promotion among children and youth in Romania. Moreover, the incentives that PES can receive are based on the performance of their teams, and not on the number of children with different psycho-motor potentials they are engaging in physical activities. In this situation, they will always want to engage only the most gifted and best performing students in physical activities. An alternative would be rewarding PES teachers based on how many students they succeed in converting from inactive to active.

In this regard, what is the role of evidence in HEPA promotion policies in Romania and how can we contribute to the process of developing evidence-informed intersectoral policies, with a more positive medium- and long-term impact on the target populations' physical activity levels?

The contribution of the Department of Public Health of Babes-Bolyai University (4) to the European research project REPOPA - Research into Policy to Enhance Physical Activity (5), implemented in the timeframe 2011-2016, consisted of: 1) Identifying, through thematic document analysis, the role of evidence in physical activity promotion policies in Romania; 2) Exploring innovative

interventions for I) increasing the utilization of research evidence (and other types of evidence such as specialist experience and expertise, preferences and values of the target group, local socioeconomic and cultural factors) in HEPA policymaking and for II) increasing intersectoral collaboration in HEPA policymaking by means of a serious game – the policy game (a one-day meeting of interested local stakeholders, meant to facilitate collaboration and joint action plans), and a Delphi consultation process (process of consultation of experts in a certain field).

The results of the REPOPA project, in which the Department of Public Health of Babes-Bolyai University was a partner, reveal the fact that in Romania, evidence is used in HEPA promotion policies mainly for the policy justification part, having a symbolic rather than instrumental role (Buse et al., 2012). In other words, evidence is not used to inform the policy action plan and consecutive activities, but to offer a formal backup to the signatory institutions. Regarding the intersectoral nature, document analysis revealed that, although at formal level there are multiple signatory institutions that have attributions in HEPA policy development and/or implementation, in practice the initiatory institution (e.g., the Romanian Government, the Ministry of Youth and Sport, a County Council) is the only one actually fulfilling its responsibilities and implementing the policy, the other partners' support and collaboration having a more symbolic role.

The interventions developed within the REPOPA project, i.e., the policy game and the Delphi consultation process, represented the means of testing innovative ways for stimulating evidence use and cross-sector collaboration in HEPA policies. In terms of results, the participants in the policy game organized at local level in Cluj-Napoca mentioned that the activity was very useful to them, allowing them to understand the role of their own institution in relation to the roles of other institutions in local HEPA policies; also, participation in the policy game offered them the opportunity to meet new interested stakeholders that they could not have met otherwise. On the other hand, participants declared that a singular intervention has very little chances of bringing positive long-term changes (i.e., use of more evidence in HEPA policymaking), given the bureaucracy and inflexibility present in public institutions in particular. The results of the Delphi consultation process consist of a list of measurable indicators for characterizing evidence-informed policy processes. The utility of these indicators resides in the easiness of their use by national and local policymaking institutions. As an example, the presence of a collaboration between a policymaking institution (e.g., the Ministry of Youth and Sport) and a research institution (e.g., the National University of Physical Education and Sport) throughout the development of a national HEPA promotion strategy may be a sensitive indicator of evidence use and cross-sector collaboration in the development of that specific strategy/policy and of its potential positive influence on the target group's attitudes and behavior towards practicing physical activities.

The REPOPA project is the first research project in Romania and at European level looking at the role of evidence in HEPA promotion policies and exploring innovative ways of increasing evidence use and cross-sectoral collaboration for the development of these policies.

However, in order to reach the desired positive impact on the Romanian population and to contribute to the development of a more active and healthier population, we have to accept and promote changes in the socioeconomic, political and administrative systems in Romania, changes that should be reflected in the way policies are being developed, implemented and especially evaluated.

In this respect, it is essential to allocate financial resources for research studies providing information on the key aspects that need to be studied at individual and institutional level (i.e., in public, private and civil society institutions), in order to facilitate more evidence-informed intersectoral policies, with a major positive impact on the HEPA levels in the Romanian population.

For more information on the REPOPA project, please visit REPOPA website www.repopa.eu.

* * *

Promovarea activităților fizice pentru sănătate (AFpS) în rândul populațiilor a fost identificată la nivel internațional drept unul dintre factorii cheie, în încercarea de a stopa sau măcar a limita epidemia de obezitate care afectează majoritatea statelor lumii (I-Min et al., 2012).

Pentru promovarea sustenabilă a AFpS în rândul populațiilor sunt însă necesare politici locale și naționale eficiente, dezvoltate și implementate intersectorial și care să utilizeze cele mai noi dovezi (din cercetare, precum și alte tipuri de dovezi precum experiența și expertiza specialiștilor din domeniu, informații provenite de la grupurile țintă, etc.) în ceea ce privește eficacitatea și impactul pe termen mediu și lung asupra populațiilor (Edwards & Tsouros, 2006).

Un exemplu elocvent pentru justificarea afirmației de mai sus este reprezentat de politicile de promovare a activității fizice (și în general a unui stil de viață sănătos) în rândul copiilor și a adolescenților. Astfel, deși cele mai recente studii din literatura de specialitate sugerează faptul că abordările intersectoriale (implicarea, pe lângă sectorul educație și a altor sectoare, precum sectorul sport sau sănătate) și la mai multe nivele (dezvoltarea de intervenții în școală, dar și acasă și în comunitate) sunt mult mai eficiente pe termen lung în schimbarea comportamentelor, respectiv în adoptarea de către copii și tineri a unui stil de viață activ (1), aceste tipuri de abordări sunt inexistente în România și destul de rare în alte state europene. Deși literatura de specialitate cuprinde un număr însemnat de articole științifice care dovedesc importanța practicării activităților fizice pentru menținerea și îmbunătățirea sănătății (Dumitru, 2016), momentan întârzie să apară strategii, politici și programe naționale "reale", care să valideze aceste dovezi, în ciuda recomandărilor și sprijinului financiar și logistic și la nivel European oferit prin programe de finanțare precum Erasmus + Sport (2).

De asemenea, deși este sugerat în literatură rolul dovezilor științifice în fundamentarea programelor de promovare a AFpS în rândul copiilor și adolescenților - pentru o mai bună adaptare a acestor intervenții la nevoile, potențialul și preferințele publicului țintă (3), de cele mai multe ori aceste intervenții stimulează și implică în mare

măsură tocmai pe copiii cu un nivel de activitate fizică mediu sau ridicat și cu aptitudini, potențial și interes pentru practicarea activităților fizice, mărind și mai mult decalajul între acești copii activi și marea masă de copii sedentari.

Putem oferi aici drept exemplu competițiile sportive organizate în cadrul școlii, la care sunt angrenați în echipele școlilor doar cei mai dotați și în formă elevi, deși obiectivul de bază al acestor competiții nu este - sau nu ar trebui să fie - performanța sportivă, ci mișcarea (AFpS) efectuată de cât mai mulți dintre elevi. Aceste practici sunt o reflecție a viziunii și expertizei practicienilor din domeniu, respectiv a profesorilor de educație fizică și sport, a căror pregătire profesională, având un pronunțat caracter orientat spre sport, îi împiedică să înțeleagă importanța AFpS și să promoveze mișcarea pentru sănătate în rândul cât mai multor elevi. Din acest context reiese importanța colaborării intersectoriale (respectiv a medicilor cu profesorii de educație fizică și sport) în procesul de promovarea a AFpS în rândul populației de copii și adolescenți din România. Un alt aspect care trebuie menționat este legat de stimulentele greșite acordate acestor profesori la nivel de sistem național de educatie. Atâta timp cât profesorii de EFS sunt recompensați pe baza performanțelor pe care echipele școlii pe care le conduc le au, acești profesori vor căuta întotdeauna performanța și nu angrenarea în activități fizice a unui număr cât mai mare de copii, cu potențiale psiho-motrice diferite. O alternativă ar fi recompensarea acestor profesori în funcție de numărul de sedentari pe care reușesc să îi implice în activități fizice.

Pornind de la aspectele prezentate anterior, devine de un real interes întrebarea: ”Care este rolul dovezilor în politicile de promovare a AFpS în România și cum putem contribui în procesul de dezvoltare a unor politici intersectoriale, informate de dovezi, cu un impact pozitiv pe termen mediu și lung asupra populației țintă?”

Contribuţiile Departamentului de Sănătate Publică din cadrul Facultății de Științe Politice, Administrative și ale Comunicării, Universitatea Babeş-Bolyai Cluj-Napoca (4) în cadrul roiectului European de cercetare REPOPA (Research into Policy to Enhance Physical Activity (Utilizarea dovezilor în procesul de dezvoltare a politicilor de promovare a activității fizice (5), desfășurat în perioada 2011-2016, au sprijinit atingereaurmătoarelor obiective: 1) Identificarea, prin intermediul analizei tematice de document, a rolului dovezilor în politicile de promovare a activității fizice în România; 2) Explorarea intervențiilor inovative pentru: a) creșterea utilizării dovezilor din cercetare (și a altor tipuri de dovezi: experiența și expertiza specialiștilor din domeniu, preferințele și valorile grupului țintă, factorii socio-economici și culturali locali); b) pentru creșterea colaborării intersectoriale în procesul de dezvoltare a politicilor de promovare a AFpS, prin intermediul unui proces Delphi (proces de consultare a specialiștilor) și a unei simulări a procesului de dezvoltare a unei politici publice la nivel local - policy game (întâlnire de o zi a persoanelor interesate dintr-un anumit domeniu, cu scopul de a crea linii de acțiune comune).

Rezultatele obținute în cadrul acestui proiect de cercetare, în care Departamentul de Sănătate Publică, Facultatea de Științe Politice, Administrative și ale Comunicării, Universitatea Babeș-Bolyai a fost partener, relevă faptul că în România, politicile de promovare a AFpS utilizează dovezile din cercetare în special în partea de argumentare a nevoii de dezvoltare a politicii, aceste dovezi având rol simbolic, nu instrumental (Buse et al., 2012). Altfel spus, dovezile nu sunt folosite pentru a informa dezvoltarea planului de acțiune și a activităților aferente acestui plan, ci pentru a oferi o acoperire formală instituțiilor semnatare. În ceea ce privește caracterul intersectorial, rezultatele analizei documentelor de politici au relevat faptul că, deși la nivel formal există mai multe instituții semnatare și cu atribuții în dezvoltarea sau implementarea unei politici de promovare a AFpS naționale sau locale, la nivel practic, instituția inițiatoare (fie că vorbim de Guvernul României, Ministerul Tineretului și Sportului sau un Consiliu Județean) este singura cu atribuții și responsabilități clare în partea de implementare, sprijinul și colaborarea inter-instituțională având (ca și în cazul utilizării dovezilor în documentele de politici) un rol mai mult simbolic.

Intervențiile desfășurate în cadrul proiectului, respectiv simularea procesului de dezvoltare a unei politici publice la nivel local - policy game și procesul de consultare Delphi, au avut rolul de a testa metode inovative de stimulare a utilizării dovezilor și a abordărilor intersectoriale în politicile de promovare a AFpS. Astfel, participanții la policy game-ul desfășurat în Cluj-Napoca au apreciat intervenția ca fiind utilă, ajutându-i să înțeleagă rolul propriei instituții precum și rolurile altor instituții în politicile locale de promovare a AFpS și ajutându-i să intre în contact cu persoane pe care nu le-ar fi putut aborda în alt context. Pe de altă parte, aceștia au declarat că o intervenție singulară nu poate aduce modificări pozitive pe termen lung (de ex. utilizarea mai multor dovezi în dezvoltarea de politici de promovare a AFpS), dată fiind inflexibilitatea și birocrația la nivel instituțional, în special în sectorul public.

În urma procesului de consultare Delphi, am obținut o listă de indicatori măsurabili pentru caracterizarea proceselor de dezvoltare a politicilor de promovare a AFpS informate de dovezi. Utilitatea acestor indicatori rezidă din ușurința cu care ei pot fi folosiți de instituții implicate în dezvoltarea de politici la nivel local și național. Ca exemplu de indicator, existența unei colaborări între instituția dezvoltatoare de politici (de ex. Ministerul Tineretului și Sportului) și o instituție de cercetare (de ex. Universtatea Națională de Educație Fizică și Sport) pe parcursul procesului de dezvoltare a unei strategii naționale de promovare a AFpS în rândul populației din România poate constitui un indicator fidel al utilizării dovezilor și al abordării intersectoriale, în dezvoltarea acelei politici și astfel ne poate orienta asupra potențialului pe care respectiva politică l-ar putea avea în influențarea pozitivă a atitudinilor și a comportamentelor publicului țintă, în ceea ce privește practicarea AFpS.

Proiectul REPOPA este primul proiect de cercetare din România și din Europa orientat asupra studierii rolului dovezilor în politicile de promovare a AFpS în România și a explorării unor metode inovative pentru stimularea utilizării unor abordări intersectoriale, informate de dovezi în dezvoltarea acestor politici.

Pentru a putea avea impactul pozitiv dorit asupra populației din România, respectiv pentru a contribui la dezvoltarea unei populații mai active și mai sănătoase, trebuie să acceptăm necesitatea producerii unor schimbări

la nivelul sistemelor socio-economic, politic și administrativ în România, schimbări care să se reflecte în procesele prin care sunt dezvoltate, implementate și (în special!) evaluate politicile de promovare a AfpS, la nivel național și local în România.

În acest sens, sunt esențiale finanțarea și desfășurarea de studii științifice care să ofere informații asupra aspectelor cheie care trebuie abordate la nivel de indivizi și instituții (publice, private și aparținând societății civile) pentru a facilita dezvoltarea unor politici intersectoriale, informate de dovezi, cu impact pozitiv major asupra nivelelor de AFpS ale populației din România.

Pentru mai multe informații despre proiectul REPOPA și rezultatele acestui proiect se poate vizita site-ul REPOPA www.repopa.eu.

References

Buse K, Mays N, Walt G. Making Health Policy. Open University Press, 2012, 169-189.

Dumitru G. Physical inactivity kills (II). Who, how and with what results fights against it in Europe and Romania? Palestrica of the Third Millennium - Civilization and Sport. 2016;17(3):179-184.

Edwards P, Tsouros A. Promoting physical activity and active living in urban environments. The Role of Local Governments. Copenhagen: World Health Organization - Regional Office for Europe; Report No. 92-890-2181-0, 2006.

I-Min L, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. The Lancet. 2012;380(9838):219-229. doi: 10.1016/S0140-6736(12)61031-9.

Websites

(1) Steps to health: a European framework to promote physical activity for health. Copenhagen: WHO Regional Office for Europe; Available from: http://www.euro.who.int/en/health-topics/disease-prevention/physicalactivity/publications/2007/steps-to-health.-a-european-framework-to-promote-physicalactivity-for-health-2007. Accessed in Sept. 2016.

(2) http://eacea.ec.europa.eu/home/erasmus-plus/actions/sport. Accessed in Sept. 2016

(3) Developing the European Dimension in sport. European Commission. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, 2011. Available from: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52011DC0012. Accessed in Sept. 2016.

(4) Cluj School of Public Health, 2016. Available from: www.publichealth.ro. Accessed in Sept. 2016.

(5) REPOPA, 2016. Available from: www.repopa.eu. Accessed in Sept. 2016.

Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 4, October-December 2016, 261–268

ORIGINAL STUDIES

The anthropometric profile of junior handball players (Note I)

Profilul antropometric al jucătorilor de handbal juniori (Nota I)

Cristian Potoră [1], Nikolaos Mavritsakis [2,3], Simona Tache [1]
[1] Iuliu Haţieganu University of Medicine and Pharmacy, Cluj-Napoca, Department of Biosciences, Physiology
[2] 1 December 1918 University of Alba Iulia, Department of Physical Education and Sport
[3] The Geriatrics and Gerontology Centre, Alba Iulia

Abstract

Background. Basic anthropometric parameters (height, weight, circumferences, arm span) and specific anthropometric parameters (hand span, hand grip strength) might influence performance, success in competition, training conditioning, the playing position, selection and identification of talents.

Aims. We aimed to study the anthropometric profile of junior handball players in relation to age, and the effect of maturation on general basic anthropometric parameters.

Methods. The basic anthropometric measurements determined by direct methods were: weight; height; arm span; sitting height; abdominal circumference; biacromial diameter; bitrochanteric diameter. The anthropometric parameters determined by indirect methods were: body mass index (BMI) and chest elasticity.

Results. The comparative changes of basic anthropometric parameters in the experimental groups of athletes versus the control groups show: increase of body mass at the age of 16 and 17; increase of height at the age of 15 and 16; insignificant changes of BMI, all subjects being normal weight; increase of sitting height, arm span, chest elasticity and abdominal circumference at the age of 16, 17 and 18 compared to values corresponding to 15, 16, 17 years of age; increase in bitrochanteric diameter at the age of 15 and 16.

Conclusions. The changes of basic anthropometric parameters in junior handball players can be considered as adaptive changes determined by specific physical training and maturation, and they should be taken into account for the tertiary selection of athletes.

Key words: junior handball players, basic anthropometric parameters.

Rezumat

Premize. Indicatorii antropometrici bazali (înălţime, greutate, perimetru, anvergură) şi specifici (anvergura mâinii, forţa de contracţie a flexorilor) ar putea influenţa performanţele, reuşita în competiţii, condiţionarea antrenamentului, poziţia de joc, selecţia şi identificarea talentelor.

Obiective. Ne-am propus să studiem profilul antropometric al jucătorilor juniori de handbal în raport cu vârsta şi efectul maturizării asupra indicatorilor antropometrici generali bazali.

Metode. Indicatorii antropometrici bazali determinaţi prin metode directe au fost: greutatea; talia; anvergura; înălţimea bustului; perimetrul abdominal, diametrul biacromial; diametrul bitrohanterian. Indicatorii antropometrici determinaţi prin metode indirecte au fost: indicele de masă corporală (IMC) şi elasticitatea toracică.

Rezultate. Modificările comparative ale indicatorilor antropometrici bazali la loturile experimentale de sportivi faţă de loturile de control arată: creşteri ale masei corporale la 16 şi 17 ani; creşteri ale înălţimii la 15 şi 16 ani; modificări nesemnificative ale BMI, toţi subiecţii fiind normo-ponderali; creşteri ale înălţimii bustului, anvergurii, elasticităţii toracice şi perimetrului abdominal la 16, 17 şi 18 ani, faţă de valorile corespunzătoare loturilor de la 15, 16, 17, ani; creşteri ale diametrului bitrohanterian la 15 şi la 16 ani.

Concluzii. Modificările indicatorilor antropometrici bazali la handbaliştii juniori pot fi considerate ca modificări adaptative determinate de pregătirea fizică specifică şi maturizare şi trebuie luate în considerere pentru selecţia terţiară a sportivilor.

Cuvinte cheie: jucători de handbal juniori, indicatori antropometrici bazali.

Received: 2016, September 12; *Accepted for publication:* 2016, September 29;
Address for correspondence: 400192 Cluj-Napoca, Ştefan cel Mare Square no. 4, tel. 40-(0)264-594672, fax. 40-(0)264-592832
E-mail: cristipotora@gmail.com
Corresponding author: Cristian Potoră, cristipotora@gmail.com

Introduction

Handball is a team sport, which involves 7 players (one of these players is assigned the position of goalkeeper). It can be played by both male and female teams. It is for the most part a dynamic, contact sport, because it is practiced under full contact and mental pressure conditions. Players are specialized in different positions. The positions in the handball game are the following: goalkeeper, left back, right back, center, right wing, pivot, left wing. Handball players are required to possess different technical skills and fitness components (Marques & Gonzalez-Badillo, 2006; Ronglan et al., 2006; Buchheit et al., 2009; Ingebrigtsen & Jeffreys, 2012; Ingebrigtsen et al., 2013).

The specific characteristics of the handball game, implicitly of a handball team, are frequent changes in effort intensity, specific technique, full contact confrontations, mental abilities, which mainly require coordination, endurance, strength and intuition. The biomotor skills needed by a handball player are: coordination and agility/ dexterity, force/strength and resistance.

Handball is one of the sports games with the highest physical demands. The categories of movement specific to the handball game are the following: jumping, sprinting, throwing, blocking and pushing (Gorostiaga et al., 2006). In order to plan a high quality of sports training, anthropometric measurements and evaluations of the players' morphofunctional status are needed. For an effective training process, it is essential to know the current anthropometric characteristics and the morphofunctional characteristics of players in different positions (Srhoj et al., 2002). Analyses have shown that handball players perform various movement activities depending on their playing position. During the game, wing players cover the greatest distance, by sprinting, while the backs cover the gate. The specific anthropometric characteristics (height, weight, palm length and width) are the main criteria for the selection of handball players in different positions (Zapartidis et al., 2009a; Zapartidis et al., 2009b; Srhoj et al., 2002).

Many studies have aimed to establish the anthropometric profile of handball players depending on:

a) age in juniors and seniors (Bon et al., 2015; Silva et al., 2013; Vieira et al., 2013; Hassan et al., 2007; Matthys et al., 2012; Wagner et al., 2014; Vishapuu & Jürimäe, 2009; Ingebrigtsen et al., 2013; Nikolaidis & Ingebrigsten, 2013; Debanne & Laffaye, 2011; Mohamed et al., 2009; Milanese et al., 2011)

b) sex (Bon et al., 2015; Sekulic et al, 2013; Wagner et al., 2014)

c) somatotype (Bon et al., 2015; Raschka & Wolthausen, 2007; Nikolaidis et al., 2015)

d) morphological profile (Bon et al., 2015; Ghobadi et al., 2013; Vieira et al., 2013; Moss et al., 2015; Massuça & Fragoso, 2015; Matthys et al., 2013; Krüger et al., 2014; Moncef et al., 2012; Srhoj et al., 2002; Chaouachi et al., 2009; Lidor et al., 2005; Ziv & Lidor, 2009; Ingebrigsten et al., 2013)

e) playing position in the team (Bon et al., 2015; Ghobadi et al., 2013; Michalsik et al., 2015; Sibila & Pori, 2009; Vila et al., 2012; Silva et al., 2013; Nikolaidis et al., 2015; Nikolaidis & Ingebrigsten, 2013; Krüger et al., 2014; Rousanoglou et al., 2014; Haugen et al., 2016; Matthys et al., 2013; Hassan et al., 2007)

f) level of training for elite and non-elite players (Ghobadi et al., 2013; Michalsik et al., 2015; Vieira et al., 2013; Moss et al., 2015; Rousanoglou et al., 2014)

g) nutrition status (Waly et al., 2013)

h) technical profile (Michalsik et al., 2015)

i) experience in sport (Vila et al., 2012; Wagner et al., 2016)

Hypothesis

The junior period spans between the age of 13 and 18 years. The categories of juniors III, II and I in handball cover the pubertal, postpubertal and adolescent periods: 13-14, 15-16 and 17-18 years.

Considering that basic anthropometric parameters (height, weight, abdominal circumference, arm span) and specific anthropometric parameters (hand span, hand grip strength) might influence performance, success in competition, training conditioning, the playing position, selection and identification of talents, we aimed to study the anthropometric profile of junior handball players in relation to age, and the effect of maturation on general basic anthropometric parameters.

Material and methods

The research was conducted with the approval of the Cluj County School Inspectorate, the subjects' informed consent, the consent obtained from the subjects' parents, and the approval of the sports medicine doctor at the *George Coşbuc* National College in Cluj-Napoca.

Research protocol

a) Period and place of the research

The determinations of anthropometric parameters in athletes of the experimental groups and in the control groups were performed for each group at two times: time T1 - October 2014, and time T2 - October 2015.

Studies were carried out at the school medical office of the *George Coşbuc* National College in Cluj-Napoca and at the medical office of the Sports High School in Cluj.

b) Subjects and groups

The research was conducted in 6 groups of subjects, each consisting of 10 subjects.

The experimental groups (E) included professional athletes from the Sports High School Cluj and the Potaissa Handbal Club Association Turda, while the control groups (C) comprised pupils from the *George Coşbuc* National College in Cluj-Napoca, as follows:

C1 – subjects born in 1997, aged 17.77 ± 0.26 at time T1

C2 – subjects born in 1998, aged 16.57 ± 0.19 at time T1

C3 – subjects born in 1999, aged 15.88 ± 0.25 at time T1

E1 – subjects born in 1997, aged 17.72 ± 0.26 at time T1

E2 – subjects born in 1998, aged 16.24 ± 0.38 at time T1

E3 – subjects born in 1999, aged 15.47 ± 0.17 at time T1

We mention that at time T2, the groups were one year older.

The weekly training program of groups C consisted of general physical training 1-2 hours/week, while the weekly training of groups E consisted of specific physical training 2-3 hours/day, 5 days/week.

c) Tests applied

The basic anthropometric parameters determined by direct methods were the following (Cordun, 2009; Neagu, 2014):

- weight, expressed in kg, measured with a digital balance;
- height, expressed in cm, measured with a stadiometer;
- arm span, expressed in cm, measured with a centimeter tape;
- sitting height, measured with a stadiometer;
- biacromial diameter, expressed in cm, measured with an anthropometric compass;
- bitrochanteric diameter, expressed in cm, measured with an anthropometric compass.

The anthropometric parameters determined by indirect methods were:

- body mass index (BMI), expressed in kg/m^2
- chest elasticity, expressed in cm.

d) Statistical processing

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

Results

a) Body mass (Table I)

The statistical analysis of the values of *body mass for unpaired samples* showed: at time T1, statistically significant differences between groups E2-E3 ($p < 0.05$) and between groups C2-E2 ($p < 0.05$); at time T2, statistically significant differences between groups C2-E2 ($p < 0.05$).

The statistical analysis of the values of *body mass for paired samples,* between the two times, evidenced: in groups C – statistically significant differences in groups C1, C2 and C3 ($p < 0.001$), and in groups E – statistically significant differences in groups E1 and E3 ($p < 0.05$).

b) Height (Table II)

The statistical analysis of the values of *height*, *considering all six groups*, revealed statistically significant differences between at least two of the groups, both at time T1 and at time T2 ($p < 0.01$).

The statistical analysis of the values of *height for unpaired samples* showed, at T1 and T2, statistically significant differences between groups C3-E3 ($p < 0.05$).

The statistical analysis of the values of *height for paired samples,* between the two times, evidenced: in groups C – statistically significant differences in groups C1 and C2 ($p < 0.001$), in group C3 ($p < 0.01$), and in groups E – statistically significant differences in groups E2 and E3 ($p < 0.01$).

c) Body mass index (Table III)

The statistical analysis of the values of the *body mass index (BMI), considering all six groups*, indicated no statistically significant differences between the groups at time T1 or at time T2 ($p > 0.05$).

The statistical analysis of BMI values, *considering all groups C,* showed no statistically significant differences between the groups at T1 or at T2 ($p > 0.05$).

The statistical analysis of BMI values, *considering all groups E*, demonstrated no statistically significant differences between the groups at T1 or at T2 ($p > 0.05$).

The statistical analysis of BMI values *for unpaired samples* revealed: at time T1 – no statistically significant differences between any two groups ($p > 0.05$); at time T2 – no statistically significant differences between any two groups ($p > 0.05$).

Table I

Comparative analysis of *body mass* values (kg) in the studied groups and statistical significance.

Time	Group	Mean	SE	Median	SD	Min	Max	Statistical significance (p)				
T1	C1	75.90	2.9343	73.50	9.2790	58	90	C+E	0.0777	E1-E2	0.7538	C1 (T1-T2)
	C2	72.50	3.6492	74.00	11.5398	53	89	C1-C2-C3	0.7269	E1-E3	0.1816	**5.64×10^{-5}**
	C3	72.30	4.0140	73.00	12.6934	48	88	E1-E2-E3	0.1003	E2-E3	**0.0213**	C2 (T1-T2)
	E1	84.15	5.3182	82.25	16.8177	57.5	109	C1-C2	0.4777	C1-E1	0.1959	**0.0001**
	E2	87.10	4.4258	83.50	13.9956	67	120	C1-C3	0.4795	C2-E2	**0.0104**	C3 (T1-T2)
	E3	76.05	2.0823	76.50	6.5847	64	86	C2-C3	0.9710	C3-E3	0.4209	**0.0005**
T2	C1	79.80	2.9695	78.50	9.3903	60	95	C+E	0.0583	E1-E2	0.7246	E1 (T1-T2)
	C2	75.20	3.8000	76.00	12.0167	55	91	C1-C2-C3	0.4892	E1-E3	0.0991	**0.0194**
	C3	73.90	4.0012	75.00	12.6531	50	90	E1-E2-E3	0.0998	E2-E3	0.0536	E2 (T1-T2)
	E1	90.15	5.9685	88.00	18.8739	61.5	122	C1-C2	0.3535	C1-E1	0.1445	0.4961
	E2	87.40	4.0585	85.50	12.8340	69	118	C1-C3	0.2527	C2-E2	**0.0489**	E3 (T1-T2)
	E3	78.70	2.1861	79.00	6.9130	66	90	C2-C3	0.8164	C3-E3	0.3103	**0.021**

Table II

Comparative analysis of *height* values (cm) in the studied groups and statistical significance

Time	Group	Mean	SE	Median	SD	Min	Max	Statistical significance (p)				
T1	C1	181.00	2.1654	181.50	6.8475	169	190	C+E	**0.0046**	E1-E2	0.5766	C1 (T1-T2)
	C2	177.50	1.4004	178.00	4.4284	169	183	C1-C2-C3	0.2670	E1-E3	0.5870	**0.0003**
	C3	176.30	1.9267	179.00	6.0928	163	182	E1-E2-E3	0.5141	E2-E3	0.2208	C2 (T1-T2)
	E1	185.55	2.7187	185.75	8.5973	171	197	C1-C2	0.1948	C1-E1	0.2079	**0.0002**
	E2	187.65	2.4989	189.75	7.9024	172	196	C1-C3	0.1472	C2-E2	0.1378	C3 (T1-T2)
	E3	183.75	1.7674	183.00	5.5889	176	192	C2-C3	0.8387	C3-E3	**0.0154**	**0.002**
T2	C1	182.50	2.1512	182.50	6.8028	170	192	C+E	**0.0028**	E1-E2	0.5841	E1 (T1-T2)
	C2	178.80	1.4205	179.00	4.4920	170	185	C1-C2-C3	0.2610	E1-E3	0.4232	0.2138
	C3	177.80	1.9310	180.00	6.1065	164	184	E1-E2-E3	0.4350	E2-E3	0.2273	E2 (T1-T2)
	E1	187.00	1.9134	185.50	6.0507	178	197	C1-C2	0.1705	C1-E1	0.1355	**0.0026**
	E2	188.80	2.5972	191.50	8.2131	173	199	C1-C3	0.1573	C2-E2	0.1432	E3 (T1-T2)
	E3	184.90	1.7042	184.50	5.3893	177	193	C2-C3	0.8968	C3-E3	**0.0107**	**0.0026**

The statistical analysis of BMI values *for paired samples*, between the two times, showed no statistically significant differences for any of the groups ($p > 0.05$).

d) Sitting height (Table IV)

The statistical analysis of the values of *sitting height*, *considering all six groups*, showed statistically significant differences between at least two of the groups both at T1 and T2 ($p < 0.001$).

The statistical analysis of the values of *sitting height*, *considering all groups C*, evidenced statistically significant differences between at least two of the groups at time T2 ($p < 0.05$).

The statistical analysis of the values of *sitting height for unpaired samples* revealed: at time T1, statistically significant differences between groups C2-C3 ($p < 0.05$) and groups C1-E1, C2-E2 and C3-E3 ($p < 0.001$).

At T2, statistically significant differences were observed between groups C1-C2 and C2-C3 ($p < 0.05$) and between groups C1-E1, C2-E2 and C3-E3 ($p < 0.01$).

The statistical analysis of the values of *sitting height for paired samples,* between the two times, showed: in groups C - statistically significant differences in groups C2 and C3 ($p < 0.01$) and in groups E – statistically significant differences in groups E2 and E3 ($p < 0.01$).

e) Arm span (Table V)

The statistical analysis of the values of *arm span*, *considering all six groups*, demonstrated statistically significant differences between at least two groups both at T1 and T2 ($p < 0.001$).

The statistical analysis of the values of *arm span for unpaired samples* showed: at time T1, statistically significant differences between groups C2-E2 ($p < 0.001$), groups C3-E3 ($p < 0.01$) and groups C1-E2 ($p < 0.05$); at time T2, statistically significant differences betewen groups C2-E2 ($p < 0.001$), groups C3-E3 ($p < 0.01$) and groups C1-E2 ($p < 0.05$).

The statistical analysis of the values of *arm span for paired samples,* between the two times, evidenced: in groups C – statistically significant differences in group C1 ($p < 0.001$), groups C2 and C3 ($p < 0.01$), and in groups E – statistically significant differences in group E2 ($p < 0.05$).

f) Chest elasticity (Table VI)

The statistical analysis of the values of *chest elasticity*, *considering all six groups*, showed statistically significant differences between at least two of the groups both at T1 and T2 ($p < 0.001$).

Table III

Comparative analysis of *BMI* values (kg/m^2) in the studied groups and statistical significance.

Time	Group	Mean	SE	Median	SD	Min	Max	Statistical significance (p)				
T1	C1	23.10	0.5949	22.85	1.8813	20.31	26.20	C+E	0.7071	E1-E2	0.7394	C1 (T1-T2)
	C2	22.98	1.0961	22.76	3.4663	18.56	28.73	C1-C2-C3	0.9883	E1-E3	0.2034	0.3485
	C3	23.19	1.1690	22.78	3.6966	18.07	29.40	E1-E2-E3	0.2570	E2-E3	0.1051	C2 (T1-T2)
	E1	24.28	1.1639	22.66	3.6806	19.21	31.34	C1-C2	0.9209	C1-E1	0.3856	0.7507
	E2	24.65	0.9065	24.04	2.8665	21.79	31.24	C1-C3	0.9484	C2-E2	0.7359	C3 (T1-T2)
	E3	22.53	0.5873	22.28	1.8572	20.42	26.11	C2-C3	0.8959	C3-E3	0.6228	0.9439
T2	C1	23.89	0.5584	23.57	1.7659	20.76	26.60	C+E	0.5872	E1-E2	0.5648	E1 (T1-T2)
	C2	23.48	1.1071	23.02	3.5008	19.03	29.05	C1-C2-C3	0.9095	E1-E3	0.1117	0.4675
	C3	23.31	1.1328	22.95	3.5823	18.59	29.39	E1-E2-E3	0.2365	E2-E3	0.2101	E2 (T1-T2)
	E1	25.64	1.4106	24.32	4.4606	19.41	32.42	C1-C2	0.7469	C1-E1	0.2719	0.6953
	E2	24.47	0.8707	23.46	2.7533	22.22	30.72	C1-C3	0.6521	C2-E2	0.6694	E3 (T1-T2)
	E3	23.02	0.5803	23.18	1.8350	20.67	26.87	C2-C3	0.9137	C3-E3	0.8244	0.1323

Table IV

Comparative analysis of *sitting height* values (cm) in the studied groups and statistical significance

Time	Group	Mean	SE	Median	SD	Min	Max	Statistical significance (p)				
T1	C1	87.00	2.2706	89.00	7.1802	69	96	C+E	**< 0.0001**	E1-E2	0.2535	C1 (T1-T2)
	C2	90.60	1.0562	91.50	3.3400	82	94	C1-C2-C3	0.0594	E1-E3	0.2533	0.0625
	C3	88.40	1.2311	89.50	3.8930	78	91	E1-E2-E3	0.3294	E2-E3	0.3998	C2 (T1-T2)
	E1	96.65	1.1082	98.25	3.5044	90	100	C1-C2	0.0621	C1-E1	**0.0002**	**0.0039**
	E2	95.85	0.8884	96.50	2.8092	89	99	C1-C3	0.5641	C2-E2	**0.0009**	C3 (T1-T2)
	E3	94.85	1.0751	95.50	3.3998	90	100	C2-C3	**0.0339**	C3-E3	**0.0009**	**0.002**
T2	C1	87.70	2.4132	89.50	7.6311	69	98	C+E	**< 0.0001**	E1-E2	0.7548	E1 (T1-T2)
	C2	92.00	1.0954	92.50	3.4641	83	96	C1-C2-C3	**0.0393**	E1-E3	0.9494	0.25
	C3	89.60	1.1662	90.50	3.6878	80	93	E1-E2-E3	0.9220	E2-E3	0.7513	E2 (T1-T2)
	E1	96.30	1.0520	97.00	3.3267	90	100	C1-C2	**0.0445**	C1-E1	**0.0014**	**0.0078**
	E2	96.90	0.9363	98.00	2.9609	90	100	C1-C3	0.4227	C2-E2	**0.0018**	E3 (T1-T2)
	E3	96.40	1.1446	97.25	3.6194	90	101	C2-C3	**0.0184**	C3-E3	**0.0020**	**0.0044**

Table V

Comparative analysis of *arm span* values (cm) in the studied groups and statistical significance.

Time	Group	Mean	SE	Median	SD	Min	Max	Statistical significance (p)				
T1	C1	177.00	2.0276	177.50	6.4118	166	186	C+E	**< 0.0001**	E1-E2	0.2133	C1 (T1-T2)
	C2	174.90	1.3860	176.00	4.3830	166	180	C1-C2-C3	0.5219	E1-E3	0.5146	**0.0007**
	C3	174.20	1.8785	176.00	5.9404	162	180	E1-E2-E3	0.2982	E2-E3	0.1265	C2 (T1-T2)
	E1	186.30	2.5951	188.00	8.2064	172	200	C1-C2	0.4052	C1-E1	0.0117	**0.0039**
	E2	191.00	2.5560	191.00	8.0829	180	201	C1-C3	0.3245	C2-E2	**7.32 x 10^{-5}**	C3 (T1-T2)
	E3	184.20	1.9709	187.00	6.2325	173	190	C2-C3	0.7679	C3-E3	**0.0031**	**0.0078**
T2	C1	179.00	2.0923	179.50	6.6165	167	188	C+E	**< 0.0001**	E1-E2	0.1200	E1 (T1-T2)
	C2	175.80	1.4591	177.00	4.6140	167	182	C1-C2-C3	0.4197	E1-E3	0.9087	0.5554
	C3	176.10	1.8883	178.50	5.9712	163	182	E1-E2-E3	0.1509	E2-E3	0.0990	E2 (T1-T2)
	E1	186.50	2.4370	188.00	7.7064	172	200	C1-C2	0.2277	C1-E1	**0.0313**	**0.025**
	E2	192.70	2.8985	193.00	9.1658	181	206	C1-C3	0.3422	C2-E2	**0.0002**	E3 (T1-T2)
	E3	186.10	2.4288	189.00	7.6804	173	199	C2-C3	0.6426	C3-E3	**0.0080**	0.4886

The statistical analysis of the values of *chest elasticity for unpaired samples* evidenced: at time T1, statistically significant differences between groups C1-E1, C2-E2 and C3-E3 ($p < 0.001$), and at time T2, statistically significant differences between groups C1-E1, C2-E2 and C3-E3 ($p < 0.001$).

The statistical analysis of the values of *chest elasticity for paired samples*, between the two times, showed: in groups E – statistically significant differences in group E1 ($p < 0.05$).

g) Abdominal circumference (Table VII)

The statistical analysis of the values of *abdominal circumference*, *considering all six groups*, indicated statistically significant differences between at least two of the groups both at T1 and T2 ($p < 0.01$).

The statistical analysis of the values of *abdominal circumference for unpaired samples* showed: at time T1, statistically significant differences between groups E2-E3 ($p < 0.05$) and between groups C1-E1 and C2-E2 ($p < 0.01$); at time T2, statistically significant differences between groups C1-E1 ($p < 0.05$).

The statistical analysis of the values of *abdominal circumference for paired samples*, between the two times, evidenced: in groups C – statistically significant differences in group C2 ($p < 0.001$), group C1 ($p < 0.01$), and in groups E – statistically significant differences in group E1 ($p < 0.01$).

h) Biacromial diameter (Table VIII)

The statistical analysis of the values of *biacromial diameter*, *considering all six groups*, showed statistically significant differences between at least two of the groups at time T1 ($p < 0.05$).

The statistical analysis of the values of *biacromial diameter for unpaired samples* revealed: at time T1, statistically significant differences between groups C1-E1 ($p < 0.01$).

The statistical analysis of the values of *biacromial diameter for paired samples*, between the two times, showed: in groups C – statistically significant differences in groups C2 and C3 ($p < 0.001$) and in group C1 ($p < 0.05$).

i) Bitrochanteric diameter (Table IX)

The statistical analysis of the values of *bitrochanteric diameter for unpaired samples* evidenced: at time T1, statistically significant differences between groups C3-E3 ($p < 0.05$); at time T2, statistically significant differences

Table VI

Comparative analysis of *chest elasticity* values (cm) in the studied groups and statistical significance

Time	Group	Mean	SE	Median	SD	Min	Max	Statistical significance (p)				
T1	C1	4.80	0.6633	4.00	2.0976	2	8	C+E	5.16×10^{-19}	E1-E2	0.0909	C1 (T1-T2)
	C2	3.70	0.3350	3.50	1.0593	2	5	C1-C2-C3	0.2240	E1-E3	0.1605	0.0957
	C3	3.90	0.3145	4.00	0.9944	2	5	E1-E2-E3	0.1388	E2-E3	0.7304	C2 (T1-T2)
	E1	13.20	0.9522	13.50	3.0111	8	18	C1-C2	0.1626	C1-E1	**1.98×10^{-6}**	0.6193
	E2	11.20	0.5538	11.00	1.7512	9	14	C1-C3	0.2419	C2-E2	**6.96×10^{-9}**	C3 (T1-T2)
	E3	11.50	0.6540	11.00	2.0683	8	16	C2-C3	0.6685	C3-E3	**1.05×10^{-7}**	0.7804
T2	C1	4.30	0.6333	4.00	2.0028	2	8	C+E	**1.64×10^{-16}**	E1-E2	0.8024	E1 (T1-T2)
	C2	3.90	0.3786	4.00	1.1972	2	6	C1-C2-C3	0.7347	E1-E3	0.7413	**0.0491**
	C3	3.80	0.3590	4.00	1.1353	2	6	E1-E2-E3	0.9266	E2-E3	0.8995	E2 (T1-T2)
	E1	11.30	1.0440	11.00	3.3015	7	18	C1-C2	0.5957	C1-E1	**3.96×10^{-5}**	0.8049
	E2	11.00	0.5375	10.50	1.6997	8	13	C1-C3	0.5034	C2-E2	**9.32×10^{-9}**	E3 (T1-T2)
	E3	10.90	0.5667	11.00	1.7920	7	13	C2-C3	0.8502	C3-E3	**2.36×10^{-8}**	0.4754

Table VII

Comparative analysis of *abdominal circumference* values (cm) in the studied groups and statistical significance

Time	Group	Mean	SE	Median	SD	Min	Max	Statistical significance (p)				
T1	C1	72.60	1.0975	71.50	3.4705	69	80	C+E	0.0033	E1-E2	0.3625	C1 (T1-T2)
	C2	73.10	1.7667	71.00	5.5867	67	82	C1-C2-C3	0.5515	E1-E3	0.3404	**0.0091**
	C3	75.40	2.5828	72.50	8.1677	67	90	E1-E2-E3	0.1030	E2-E3	**0.0231**	C2 (T1-T2)
	E1	82.50	3.5723	79.00	11.2965	71	101	C1-C2	0.8133	C1-E1	**0.0083**	**0.0003**
	E2	84.00	2.5473	81.50	8.0554	75	100	C1-C3	0.3381	C2-E2	**0.0029**	C3 (T1-T2)
	E3	76.50	1.5147	77.00	4.7900	70	83	C2-C3	0.4730	C3-E3	0.7185	0.0547
T2	C1	74.10	1.2512	73.50	3.9567	69	82	C+E	**0.0097**	E1-E2	0.2863	E1 (T1-T2)
	C2	75.50	1.9336	73.00	6.1146	68	84	C1-C2-C3	0.9531	E1-E3	0.0515	**0.0078**
	C3	76.60	2.6466	74.50	8.3693	68	92	E1-E2-E3	0.0645	E2-E3	0.0709	E2 (T1-T2)
	E1	87.30	4.1927	83.00	13.2585	71	110	C1-C2	0.5524	C1-E1	**0.0117**	> 0.9999
	E2	82.40	2.4230	80.50	7.6623	74	102	C1-C3	0.8381	C2-E2	0.0918	E3 (T1-T2)
	E3	77.60	1.4621	77.00	4.6236	72	87	C2-C3	0.9553	C3-E3	0.3813	0.1022

Table VIII

Comparative analysis of *biacromial diameter* values (cm) in the studied groups and statistical significance

Time	Group	Mean	SE	Median	SD	Min	Max	Statistical significance (p)				
T1	C1	40.00	0.7149	40.00	2.2608	36	43	C+E	**0.0182**	E1-E2	0.4320	C1 (T1-T2)
	C2	41.10	0.6046	41.00	1.9120	38	44	C1-C2-C3	0.4812	E1-E3	0.1424	**0.0313**
	C3	40.00	0.8563	40.00	2.7080	36	44	E1-E2-E3	0.2627	E2-E3	0.3231	C2 (T1-T2)
	E1	43.30	0.7895	44.00	2.4967	39	46	C1-C2	0.2554	C1-E1	**0.0062**	**0.0002**
	E2	42.40	0.7916	44.00	2.5033	38	45	C1-C3	> 0.9999	C2-E2	0.1504	C3 (T1-T2)
	E3	41.90	0.4333	42.00	1.3703	40	44	C2-C3	0.3096	C3-E3	0.0693	**4.89×10^{-5}**
T2	C1	40.90	0.7219	42.00	2.2828	36	44	C+E	0.4106	E1-E2	0.6256	E1 (T1-T2)
	C2	42.40	0.6000	42.00	1.8974	40	46	C1-C2-C3	0.4299	E1-E3	0.9159	0.3434
	C3	41.60	0.8327	42.00	2.6331	38	46	E1-E2-E3	0.9629	E2-E3	0.9842	E2 (T1-T2)
	E1	42.90	0.7219	42.50	2.2828	40	47	C1-C2	0.1991	C1-E1	0.0756	> 0.9999
	E2	42.40	0.7024	42.50	2.2211	39	46	C1-C3	0.6482	C2-E2	> 0.9999	E3 (T1-T2)
	E3	42.60	0.3399	42.50	1.0750	41	45	C2-C3	0.4471	C3-E3	0.3235	0.0781

Table IX

Comparative analysis of *bitrochanteric diameter* values (cm) in the studied groups and statistical significance

Time	Group	Mean	SE	Median	SD	Min	Max	Statistical significance (p)				
T1	C1	33.90	0.7371	33.50	2.3310	30	37	C+E	0.1511	E1-E2	0.1322	C1 (T1-T2)
	C2	34.50	0.9098	34.00	2.8771	31	40	C1-C2-C3	0.7167	E1-E3	0.0537	**0.0038**
	C3	34.50	0.4282	34.50	1.3540	32	36	E1-E2-E3	0.1327	E2-E3	0.6325	C2 (T1-T2)
	E1	34.90	0.7667	36.00	2.4244	30	38	C1-C2	0.7779	C1-E1	0.3595	**0.0078**
	E2	32.90	0.9244	32.00	2.9231	30	38	C1-C3	0.4931	C2-E2	0.0968	C3 (T1-T2)
	E3	32.90	0.5859	33.00	1.8529	31	37	C2-C3	0.4645	C3-E3	**0.0425**	**0.01**
T2	C1	34.90	0.7951	34.50	2.5144	32	39	C+E	0.0994	E1-E2	0.4184	E1 (T1-T2)
	C2	35.80	0.7572	35.00	2.3944	33	40	C1-C2-C3	0.7954	E1-E3	0.0881	0.7804
	C3	35.40	0.6000	36.00	1.8974	32	38	E1-E2-E3	0.2647	E2-E3	0.4497	E2 (T1-T2)
	E1	34.80	0.8273	35.00	2.6162	30	38	C1-C2	0.4887	C1-E1	0.9315	0.0938
	E2	33.80	0.8794	33.50	2.7809	30	38	C1-C3	0.6221	C2-E2	0.0915	E3 (T1-T2)
	E3	33.00	0.5375	33.00	1.6997	31	36	C2-C3	0.9933	C3-E3	**0.0080**	0.7263

between groups C3-E3 ($p < 0.01$).

The statistical analysis of the values of *bitrochanteric diameter for paired samples,* between the two times, showed: in groups C - statistically significant differences in groups C1 and C2 ($p < 0.01$) and in group C3 ($p < 0.05$).

Discussions

The comparative changes regarding the influence of general training and maturation on basic anthropometric parameters in control junior subjects at time T2 versus time T1 showed:

- an increase in body mass, height, arm span, abdominal circumference, biacromial diameter and bitrochanteric diameter at the age of 16, 17, 18 compared to values at the age of 15, 16, 17 corresponding to the groups;
- insignificant changes of BMI, which was within normal limits;
- an increase of sitting height at the age of 16 and 17 compared to values at the age of 15 and 16.

The comparative changes regarding the influence of specific training and maturation on basic anthropometric parameters in junior handball players at time T2 versus time T1 evidenced:

- an increase of body mass at the age of 16, 17, 18 compared to values corresponding to groups aged 15, 16, 17;
- an increase of height and sitting height at the age of 16 and 17 compared to values of groups aged 15 and 16;
- absence of significant changes in BMI, which was within normal limits;
- an increase of arm span at the age of 17 compared to values at the age of 16;
- a decrease of chest elasticity and abdominal circumference at the age of 18 compared to values at the age of 17.

The comparative changes of basic anthropometric parameters in groups E versus groups C showed:

- an increase of body mass at the age of 16 and 17;
- an increase of height at the age of 15 and 16;
- insignificant changes of BMI, all subjects being normal weight: an increase in sitting height, arm span, chest elasticity and abdominal circumference at the age of 16, 17, 18 compared to values corresponding to groups aged 15, 16, 17;
- an increase of bitrochanteric diameter at the age of 15 and 16.

Our results are in accordance with the data of other authors regarding the factors that can have a favorable influence on the anthropometric profile of junior handball players: maturation (Dias Quiterio et al., 2011; Matthys et al., 2012; Matthys et al., 2013; Vieira et al., 2013) and specific progressive training (Silva et al., 2013; Rousanoglou et al., 2014; Hermassi et al., 2015), in addition to talent (Mohamed et al., 2009; Pion et al., 2015; Moss et al., 2015; Ghobadi et al., 2013).

Conclusions

1. Biological maturation induces significant changes in body mass, height, arm span, biacromial and bitrochanteric diameters, sitting height and abdominal circumference in C juniors, with general physical training.
2. Biological maturation and specific physical training cause a significant increase of body mass, height, sitting height and arm span, and a decrease of chest elasticity and abdominal circumference in E junior handball players.
3. The increases of body mass, height, sitting height, arm span, chest elasticity and abdominal circumference are significant in E junior handball players compared to C subjects and occur at the age of 15-16.
4. The changes of basic anthropometric parameters in E junior handball players can be considered as adaptive changes induced by specific physical training and should be taken into account for the tertiary selection of athletes.

Conflicts of interests

There are no conflicts of interest.

Acknowledgments

The paper is part of the first author's doctoral thesis, in progress at the *Iuliu Haţieganu* University of Medicine and Pharmacy in Cluj-Napoca.

References

Bon M, Pori P, Sibila M. Position-related differences in selected morphological body characteristics of top-level female handball players. Coll Antropol. 2015;39(3):631-639.

Buchheit M., Laursen P.B., Kuhnle J., Ruch D., Renaud C., Ahmaidi S. (2009) Game-based training in young elite handball players. Int J Sports Med 30(4):251-258. doi: 10.1055/s-0028-1105943.

Chaouachi A, Brughelli M, Levin G et al. Anthropometric physiological and performance characteristics of elite team-handball players. J Sports Sci 2009;27:151-157.

Cordun M.Kinantropometria. Ed. CD Press. Bucureşti, 2009.

Debanne T, Laffaye G. Predicting the throwing velocity of

the ball in handball with anthropometric variables and isotonic tests. J Sports Sci. 2011;29(7):705-713. doi: 10.1080/02640414.2011.552112.

Dias Quiterio AL, Carnero EA, Baptista FM, Sardinha LB. Skeletal mass in adolescent male athletes and nonathletes: relationships with high-impact sports. J Strength Cond Res. 2011;25(12):3439-947. doi: 10.1519/JSC.0b013e318216003b.

Ghobadi H, Rajabi H, Farzad B, Bayati M, Jeffreys I. Anthropometry of World-Class Elite Handball Players According to the Playing Position: Reports From Men's Handball World Championship 2013. J Hum Kinet. 2013;31;39:213-20. doi: 10.2478/hukin-2013-0084. eCollection 2013.

Gorostiaga EM, Granados C, Ibanez J, Gonzalez Badillo JJ, Izquierdo M. Effects of an entire season on physical fitness changes in elite male handball players. Med Sci Sports Exerc. 2006;38(2):357-366.

Hasan AAA, Rahaman JA, Cable NT, Reilly T. Anthropometric profile of elite male handball players in Asia. Biol Sport, 2007;24(1):3-12.

Haugen TA, Tønnessen E, Seiler S. Physical and physiological characteristics of male handball players: influence of playing position and competitive level. J Sports Med Phys Fitness. 2016;56(1-2):19-26.

Hermassi S, van den Tillaar R, Khlifa R, Chelly MS, Chamari K. Comparison of in-season-specific resistance vs. A regular throwing training program on throwing velocity, anthropometry, and power performance in elite handball players. J Strength Cond Res. 2015;29(8):2105-2114. doi: 10.1519/JSC.0000000000000855.

Ingebrigtsen J, Jeffreys I, Rodahl S. Physical characteristics and abilities of junior elite male and female handball players. J Strength Cond Res. 2013;27(2):302-309. doi: 10.1519/JSC.0b013e318254899f.

Ingebrigtsen J, Jeffreys I. The relationship between speed, strength and jumping abilities in elite junior handball players. Serb J Sports Sci, 2012; 6: 83-88.

Krüger K, Pilat C, Uckert K, Frech T, Mooren FC. Physical performance profile of handball players is related to playing position and playing class. J Strength Cond Res. 2014;28(1):117-25. doi: 10.1519/JSC.0b013e318291b713.

Lidor R, Falk B, Arnon M, Cohen Y, Segal G, Lander Y. Measurement of talent in team handball: the questionable use of motor and physical tests. J Strength Cond Res, 2005;19: 318-325

Marques MC, Gonzalez-Badillo JJ. In-season resistance training and detraining in professional team handball players. J Strength Cond Res, 2006; 20: 563-571.

Massuça L, Fragoso I. Morphological characteristics of adult male handball players considering five levels of performance and playing position. Coll Antropol. 2015;39(1):109-118.

Matthys SP, Fransen J, Vaeyens R, Lenoir M, Philippaerts R. Differences in biological maturation, anthropometry and physical performance between playing positions in youth team handball. J Sports Sci. 2013;31(12):1344-1352. doi: 10.1080/02640414.2013.781663.

Matthys SP, Vaeyens R, Coelho-E-Silva MJ, Lenoir M, Philippaerts R. The contribution of growth and maturation in the functional capacity and skill performance of male adolescent handball players. Int J Sports Med. 2012;33(7):543-549. doi: 10.1055/s-0031-1298000.

Michalsik LB, Madsen K, Aagaard P. Technical match characteristics and influence of body anthropometry on playing performance in male elite team handball. J Strength Cond Res. 2015;29(2):416-28. doi: 10.1519/JSC.0000000000000595.

Milanese C, Piscitelli F, Lampis C, Zancanaro C. Anthropometry and body composition of female handball players according to competitive level or the playing position. J Sports Sci. 2011;29(12):1301-1309. doi: 10.1080/02640414.2011.591419. Epub 2011 Jul 19.

Mohamed H, Vaeyens R, Matthys S, Multael M, Lefevre J, Lenoir M, Philppaerts R. Anthropometric and performance measures for the development of a talent detection and identification model in youth handball. J Sports Sci. 2009;27(3):257-66. doi: 10.1080/02640410802482417.

Moncef C, Said M, Olfa N, Dagbaji G. Influence of morphological characteristics on physical and physiological performances of tunisian elite male handball players. Asian J Sports Med. 2012;3(2):74-80.

Moss SL, McWhannell N, Michalsik LB, Twist C. Anthropometric and physical performance characteristics of top-elite, elite and non-elite youth female team handball players. J Sports Sci. 2015;33(17):1780-1789. doi: 10.1080/02640414.2015.1012099.

Neagu N. Biometrie umană Vol. I - Antropometria. Ed. University Press, Târgu-Mureş, 2014.

Nikolaidis PT, Ingebrigtsen J, Póvoas SC, Moss S, Torres-Luque G. Physical and physiological characteristics in male team handball players by playing position - Does age matter? J Sports Med Phys Fitness. 2015;55(4):297-304.

Nikolaidis PT, Ingebrigtsen J. The relationship between body mass index and physical fitness in adolescent and adult male team handball players. Indian J Physiol Pharmacol. 2013;57(4):361-371.

Pion J, Segers V, Fransen J, Debuyck G, Deprez D, Haerens L et al. Generic anthropometric and performance characteristics among elite adolescent boys in nine different sports. Eur J Sport Sci. 2015; 15(5): 357-366. http://dx.doi.org/10.1080/17461391.2014.944875

Raschka C, Wolthausen C. Comparison of somatotype differences of soccer and handball players based on the methods of German and Anglo-American schools of constitutional biology. Anthropol Anz. 2007;65(3):303-316.

Ronglan LT, Raastad T, Borgesen A. Neuromuscular fatigue and recovery in elite female handball players. Scand J Med Sci Sports, 2006; 16: 267-273

Rousanoglou EN, Noutsos KS, Bayios IA. Playing level and playing position differences of anthropometric and physical fitness characteristics in elite junior handball players. J Sports Med Phys Fitness. 2014;54(5):611-621.

Sekulic D, Spasic M, Mirkov D, Cavar M, Sattler T. Gender-specific influences of balance, speed, and power on agility performance. J Strength Cond Res. 2013;27(3):802-811. doi: 10.1519/JSC.0b013e31825c2cb0.

Sibila M, Pori P. Position-related differences in selected morphological body characteristics of top-level handball players. Coll Antropol. 2009 Dec;33(4):1079-86.

Silva DAS, Petroski EL, Araujo GAC. Anthropometric and physical fitness differences among Brazilian adolescents who different team court sports. J Hum Kinet. 2013;36(1):77–86, DOI: https://doi.org/10.2478/hukin-2013-0008,

Srhoj V, Marinovic M, Rogulj N. Position specific morphological characteristics of top-l male handball players. Coll Antropol. 2002;26(1):219-227.

Vieira F, Veiga V, Carita AI, Petroski EL. Morphological and physical fitness characteristics of under-16 Portuguese male handball players with different levels of practice. J Sports Med Phys Fitness 2013;53(2):169-176.

Vila H, Manchado C, Rodriguez N, Abraldes JA, Alcaraz PE, Ferragut C. Anthropometric profile, vertical jump, and throwing velocity in elite female handball players by playing positions. J Strength Cond Res. 2012;26(8):2146-2155. doi: 10.1519/JSC.0b013e31823b0a46.

Visnapuu M, Jürimäe T. Relations of anthropometric parameters with scores on basic and specific motor tasks in young handball players. Percept Mot Skills. 2009;108(3):670-676.

Wagner H, Orwat M, Hinz M, Pfusterschmied J, Bacharach DW, von Duvillard SP, Müller E. Testing game-based performance in team-handball. J Strength Cond Res. 2016;30(10):2794-2801. doi: 10.1519/JSC.0000000000000580.

Waly MI, Kilani HA, Al-Busafi MS. Nutritional Practices of Athletes in Oman: A Descriptive Study. Oman Med J. 2013;28(5):360-364. DOI 10.5001/omj.2013.103.

Zapartidis I, Toganidis T, Vareltzis I, Christodoulidis T, Kororos C, Skoufas P. Profile of young female handball players by playing position. Serbian J Sports Sci. 2009b;3(2): 53-60

Zapartidis I, Vareltzis I, Gouvali M, Kororos P. Physical Fitness and Anthropometric Characteristics in Different Levels of Young Team Handball Players. Open Sports Sci J. 2009a;2(1):22-28.

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

Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 4, October-December 2016, 269–273

Insight into the overweight and obesity risk in primary school children: A pilot study

O introspecție asupra riscului supraponderalității și obezității la copiii din școala primară: un studiu pilot

Ancuța Banu [1,2], Costela Şerban [3], Denis Şerban [4], Brigitha Vlaicu [1]
"Victor Babes" University of Medicine and Pharmacy Timişoara, Romania
[1] Faculty of Medicine, Department of Microbiology, Discipline of Hygiene
[2] Faculty of Dentistry, Department 2, Discipline of Maxillo-Facial Surgery
[3] Faculty of Medicine, Department of Functional Sciences, Discipline of Medical Informatics and Biostatistics
[4] Faculty of Medicine, Department of Microbiology, Discipline of Microbiology

Abstract

Background. Prevalence of childhood overweight and obesity has increased worldwide during the last decades, and longitudinal studies performed in Europe have shown that the prevalence of overweight and obesity is also increasing with age, from early childhood to adulthood.

Aims. The aim of the study was to follow the prevalence of these measures and to determine the change in the risk of overweight and obesity as children progress to early adolescence.

Methods. Weight and height were measured during a follow-up of 35.9 +/- 8 months in 123 primary school children, who were 6.63 +/- 0.63 years old at the initial evaluation. Height, weight and BMI were converted to z-scores depending on age and gender using WHO methodology.

Results. An increase in the prevalence of overweight and obesity during follow-up in both genders was observed. Using initial BMI-for-age and gender z-scores categories, we demonstrated that children who were overweight and obese at the initial evaluation had a higher growth rate per month during the follow-up period, when compared to normal weight children, with a large effect size. Regarding the height growth rate, no significant differences were observed between initial BMI categories. Using BMI categories at follow-up, we found that children who were overweight in the follow-up had significantly lower mean BMI z-scores at the initial evaluation, with a large effect size.

Conclusions. These results explain the increased risk of overweight and obese children in becoming obese adults and can be used as a starting point for targeted multilevel interventions in our effort to fight obesity.

Key words: overweight, obesity, primary school children, BMI, growth rate

Rezumat

Premize. Prevalența supraponderabilității și a obezității în copilărie a crescut la nivel mondial în ultimele decenii, iar studiile longitudinale efectuate în Europa au arătat că prevalența obezității și a excesului de greutate este, de asemenea, în creștere pe măsura înaintării în vârstă, din copilăria timpurie până la maturitate.

Obiective. Studiul a urmărit modificările prevalenței supraponderabilității și a obezității pentru copiii de școală primară și determinarea riscului acestor măsuri pe măsura avansării spre adolescența timpurie.

Metode. Greutatea și înălțimea au fost măsurate consecutiv la o durată de 35,9 +/- 8 luni la 123 de copii cu vârsta de 6.63 +/- 0.63 ani la evaluarea inițială. Înălțimea, greutatea și IMC au fost convertite în scoruri z în funcție de vârstă și sex, folosind metodologia OMS.

Rezultate. A fost observată o creștere a prevalenței supraponderabilității și a obezității la reevaluare, la ambele sexe. Folosind categoriile scorurilor z IMC pentru vârstă și sex inițiale, am demonstrat că copiii supraponderali și obezi la evaluarea inițială au avut o rată de creștere mai mare pe lună pe parcursul perioadei de urmărire, în comparație cu copiii cu greutate normală, cu un efect de mărime crescută. În ceea ce privește rata de creștere în înălțime, nu au fost observate diferențe semnificative între categoriile inițiale IMC. Utilizând categoriile IMC la reevaluare, am constatat că elevii care au fost supraponderali în follow-up au avut scoruri z ale IMC semnificativ mai mici la evaluarea inițială.

Concluzii. Aceste rezultate explică riscul crescut al copiilor supraponderali și obezi de a deveni adolescenți obezi și pot fi folosite ca punct de pornire pentru intervenții specifice pe mai multe niveluri în efortul nostru de combatere a obezității.

Cuvinte cheie: supraponderali, obezi, copii de școală primară, IMC, rata de creștere.

Received: 2016, November 8; *Accepted for publication:* 2016, November 28;
Address for correspondence: Victor Babes" University of Medicine and Pharmacy; Discipline of Medical Informatics and Biostatistics, Spl. Tudor Vladimirescu No. 14, Postal Code: 300172, Timişoara, Romania
E-mail: costela.serban@umft.ro
Corresponding author: Costela Serban, costela.serban@umft.ro

Introduction

The prevalence of overweight and obesity in children and adolescents has increased over the last 40 years (Ng et al., 2014; Bac et al., 2012). Studies have shown that in the same population, the prevalence of overweight and obesity is increasing by age groups from childhood to adulthood (Wijnhoven et al., 2014). Previous (Whitaker & Dietz, 1998; Field, 2005), and recent longitudinal designs (Petkeviciene et al., 2015; Riedel et al., 2014) have demonstrated that overweight and obese children and adolescents are likely to become overweight and obese adults. Obesity is accompanied by a high risk of development of several pathologies, and even if a few decades ago diseases such as metabolic syndrome, cardiovascular diseases, type 2 diabetes and its complications in eye and kidney, obstructive sleep apnea, infertility, asthma, orthopedic complications, psychiatric diseases and cancers were specific to obese adults, now health consequences of obesity can start as early as childhood (Kelsey et al., 2014).

The aim of this study was to observe the natural prevalence of higher than normal z-scores categories of BMI-for-age, weight-for-age and height-for-age during a follow-up in primary school children and to seek differences in the growth rate between initial BMI categories, following the hypothesis that growth rate is increased in overweight and obese children, which could be a contributing reason behind the increasing prevalence of overweight and obesity by age groups.

Material and methods

The data represents partial measures and results of a study that investigates quantitative measures of oral and dental health, teeth eruption incidents and accidents, dento-maxillary aesthetics, anthropometric variables and nutritional status in relation to self-perceived image and self-esteem related to body image. The main study design received the approval of the Ethics Committee of "Victor Babes" University of Medicine and Pharmacy Timișoara, as it belongs to a PhD study registered at this institution. Participants were included after parents and children gave their informed consent regarding participation. We used only those participants who had complete anthropometric measurements of weight and height evaluated in a repeated measures design.

Research protocol

a) Period and place of the research

Examinations related to the PhD study were performed in the medical office of Middle School no 30 in Timisoara and in the Ambulatory Service of Oral and Maxillo-Facial Surgery of Timișoara City Hospital. The measurements were made by a medical team in the school's medical office, as part of the children's annual medical monitoring. The first evaluation started in November 2011 and lasted until May 2013. The second evaluation began in January 2015 and lasted until May 2015.

b) Subjects and groups

We sampled 123 school pupils in Timișoara, Romania, with a mean age of 6.63 years +/- 0.63 (85.5 +/- 6.6 months), of which boys represented 55.3% (68). We performed anthropometric measurements initially and at follow-up up after an average period of 35.9 +/- 8.0 months. The distribution of genders by age at the initial evaluation (p=0.361) and by the mean duration for follow-up (p=0.806) was homogeneous.

c) Tests applied

We initially registered the birth date, the date of evaluation and gender, and at each evaluation, weight and height were measured using standardized personnel and instruments. BMI (body mass index) was calculated according to the formula BMI=G (kg)/I $(m)^2$. For each evaluation, *z* scores were computed for weight, height and BMI according to age and gender. Weight, height and BMI were classified using the WHO Anthro software, version 3.2.2., January 2011 (1). Between evaluations, children did not participate in any diet and/or physical activity related systematic interventions. No nutritional regime was imposed, but the effect observed was a consequence of educational activity provided by school, medical activity from the medical office and family nutritional habits.

d) Statistical processing

The data were processed using IBM-SPSS 18, 2010. The value of statistical significance was set at $p < 0.05$. The mathematical values of tests were declared for significant comparisons. If tests were insignificant ($p >= 0.05$), only the value of significance (p) was reported. For tabulation of scale data, we reported the mean and standard deviation expressed to 2 decimals, and ordinal data were tabulated as percentage per group and presented with one decimal.

For ordinal or non-parametric data, we used the Mann-Whitney test for comparing 2 groups. For parametric comparison we used ANOVA, and repeated measures ANOVA and MANOVA tests were also employed.

Results

At the *initial evaluation*, using z-scores of *BMI-for-age* we found that 60.3% (41) of boys and 63.6% (35) of girls were classified as normal weight (-1; 1 SD), 11.8% (8) of boys and 12.7% (7) of girls were below the normal category (<-1 SD), and 27.9% (19) of boys and 23.6% (13) of girls were above the normal category (> 1 SD).

Using z scores of *weight-for-age*, 51.5% (35) of boys and 58.2% (32) of girls were in the normal category (-1; 1 SD), 4.4% (3) of boys and 12.7% (7) of girls were below the normal category (<-1 SD), and 44.1% (30) of boys and 29.1% (16) of girls were above the normal category of weight-for-age (> 1 SD). Using z scores of *height-for-age*, 55.9% (38) of boys and 50.9% (28) of girls were in the normal category (-1; 1 SD), 4.4% (3) of boys and 5.5% (3) of girls were in a lower than normal category (<-1 SD), and 39.7% (17) of boys and 41.7% (24) of girls were above the normal category of height-for-age (> 1 SD).

We looked for *differences between genders* in the classification for BMI-for-age, weight-for-age and height-for-age at the initial evaluation and we found that, only for weight-for-age categories, boys were significantly more frequently distributed in higher categories compared to girls, U=1455.5, z=-2.32, p=0.20, r=0.21, with a small effect size, this result indicating that boys had a higher weight in relation to age compared to girls.

At the initial evaluation of height-for-age and BMI-for-age categories we found no significant differences between genders, p=0.811 and p=0.470, respectively (Table I).

The mean age at *follow-up* was 121.9 +/- 10.8 months. The prevalence of normal weight according to BMI-for-age was 54.4% (37) for boys and 56.4% (31) for girls, the prevalence of underweight was 8.8% (6) for boys and 20.0% (11) for girls, the prevalence of overweight was 17.6% (12) for boys and 18.2% (10) for girls, and the prevalence of obesity was 19.1% (13) for boys and 5.5% (3) for girls. We observed that at follow-up, boys were significantly more frequently distributed to higher categories of *BMI* compared to girls, U=1467, z=-2.26, p=0.024, r=0.21, with a small effect size between genders.

A mixed between-within subjects analysis of variance was conducted to assess the impact of gender on z scores of BMI-for-age at the initial evaluation and follow-up. We could not find a main effect for time regarding the z-score of BMI-for-age, Wilks Lambda=0.993, p=0.369. There was also no significant interaction between gender and time, Wilks Lambda=0.97, p=0.054 (Table II & Fig. 1).

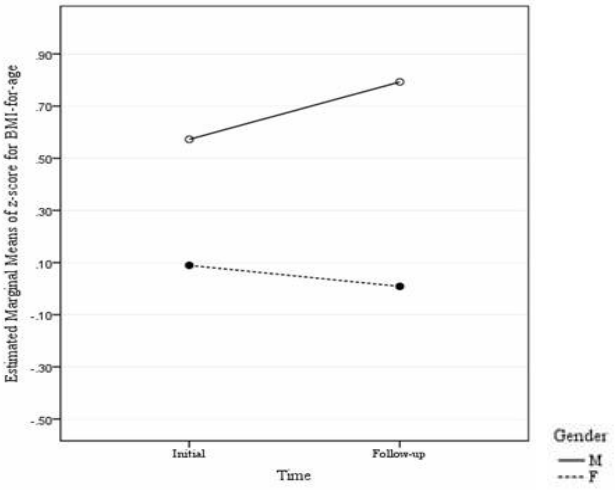


Fig. 1 – Evolution of mean z scores of BMI-for-age between initial evaluation and follow-up by gender.

Table II

Mean BMI and z-score of BMI-for-age at the initial evaluation and follow-up.

Measurements	Gender	Initial	Follow-up
BMI (mean+/- SD)	M	16.8 +/- 2.77	18.8 +/- 3.21
	F	15.8 +/- 2.16	17.2 +/- 2.82
	Total	16.3 +/- 2.55	18.1 +/- 3.13
z-score of BMI for age (mean+/- SD)	M	.6 +/- 1.47	.8 +/- 1.17
	F	.1 +/- 1.14	.0+/- 1.17
	Total	0.4 +/- 1.35	0.4 +/- 1.23

After splitting the data by BMI categories at follow-up, we found that students who were overweight at follow-up had significantly lower mean BMI-z-scores at the initial evaluation t (21)=-2.232, p=0.037, r=. For other BMI categories, the mean BMI-z-score did not differ statistically significantly between the initial evaluation and follow-up (Table III & Fig. 2).

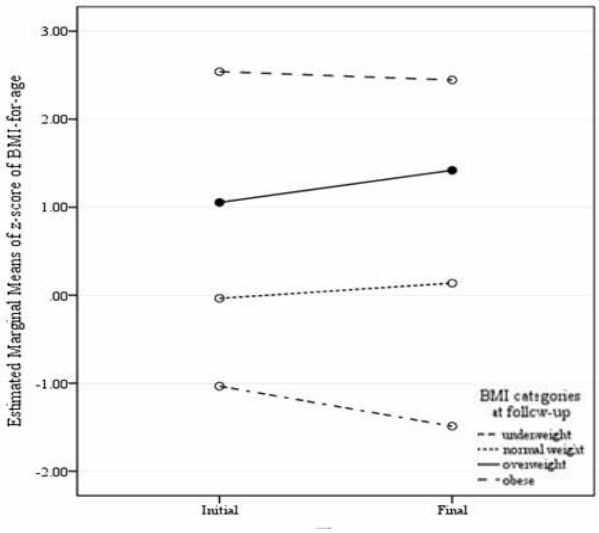


Fig. 2 – Evolution of mean z scores of BMI-for-age between initial evaluation and follow-up by BMI categories at follow-up.

Table I

Initial prevalence of height-for-age, weight-for-age and BMI-for-age categories.

Anthropometric categories	Gender	< -1 SD	(-1; 1) SD	(1;2) SD	>2 SD	Sig
Initial height for age categories	M	4.4%	55.9%	20.6%	19.1%	p=0.811
	F	9.1%	49.1%	25.5%	16.4%	
	Total	6.5%	52.8%	22.8%	17.9%	–
Initial weight for age categories	M	4.4%	51.5%	25.0%	19.1%	p=0.020
	F	12.7%	58.2%	23.6%	5.5%	
	Total	8.1%	54.5%	24.4%	13.0%	–
Initial BMI for age categories	M	11.8%	60.3%	14.7%	13.2%	p=0.470
	F	12.7%	63.6%	20.0%	3.6%	
	Total	12.2%	61.8%	17.1%	8.9%	–
Follow-up BMI for age categories	M	8.8%	54.4%	17.6%	19.1%	p=0.024
	F	20.0%	56.4%	18.2%	5.5%	
	Total	13.8%	55.3%	17.9%	13.0%	–

Table III

Mean difference of z-scores of BMI-for age by BMI categories at follow-up.

BMI categories at follow-up	N	Mean difference z-scores of BMI (Initial – Follow up)	Std error mean	95% Confidence Interval of the Difference		Sig
				Lower	Upper	
Underweight	17	.45471	.26873	-.11498	1.02439	0.110
Normal weight	68	-.17294	.09119	-.35496	.00908	0.062
Overweight	22	-.36545	.16374	-.70597	-.02494	0.037*
Obese	16	.09563	.23542	-.40617	.59742	0.690

* Sig difference p<0.05

We calculated a mean growth rate in weight and height per month and wanted to investigate if the weight and height growth rate per month was influenced by initial BMI-for-age categories and gender; therefore we used a two-way between-groups multivariate analysis to investigate differences in weight and height growth per month by gender and BMI categories. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance and covariance matrices, multicollinearity, and no serious violations were noted. There were statistically significant differences between BMI categories on the combined variables, $F(6)=4.2$, $p<0.001$, Wilks Lambda=0.811, eta squared=0.1. Between sex categories, the difference on combined variables was not statistically significant, $p=0.136$.

When the results of the dependent variables were considered separately, the only difference to reach statistical significance was weight growth per month by BMI categories, $F(3)=8.32$, $p<0.001$, partial eta squared=0.178. After applying a Sidak correction, we further investigated this result and found out that compared to the normal category of BMI, overweight (mean difference=-0.105, SE=0.030, $p=0.001$) and obese children (mean difference=-0.126, SE=0.026, $p=0.021$) significantly gained more weight per month. The difference between the normal category of BMI and the lower than normal category was not significant in relation to the accumulated weight per month (mean difference=0.015, SE=0.030, $p=0.997$).

Height growth per month by BMI categories showed no statistically significant differences, $p=0.748$ (Table IV & Fig. 3).

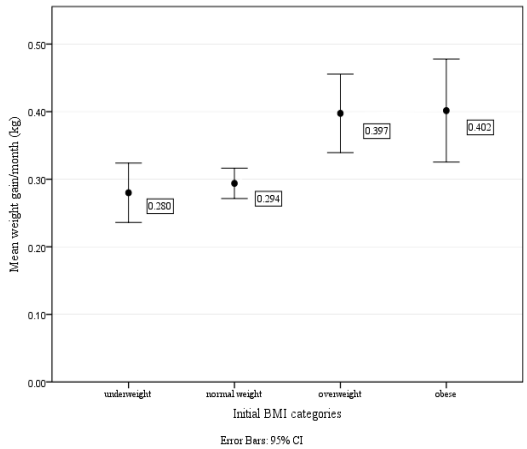


Fig. 3 – Mean weight gained per month (kg) by BMI categories.

Discussions

For our group, at the initial evaluation made at a mean age of 7 years +/- 8 months, the prevalence of overweight was 17.1% and the prevalence of obesity was 8.9%. The follow-up evaluation was made at a mean age of 10 +/- 11 months and showed a 17.9% prevalence of overweight and a 13.0% prevalence of obesity. The prevalence of overweight increased by 0.81% with 95% CI (0.14; 4.46) and that of obesity by 4.7% with 95% CI (1.75; 9.17). This rise in overweight and obesity by age groups was also observed in other epidemiological studies with different designs conducted in Europe (Wijnhoven et al., 2014; Brettschneidera et al., 2015; Finucane et al., 2015). For the age of 7, the prevalence of overweight and obesity found in our sample was exceeded by reports from countries such as Greece, Hungary, Ireland and Portugal. In a German study, the authors observed an increase in the prevalence of overweight and obesity until 2004, followed by a constant evolution or even a reduction in prevalence between 2004 and 2008, as a consequence of preventive measures initiated in the 1990s (Moss et al., 2012). No direct intervention regarding healthy eating, dieting or sports activities was targeted in our group during the follow-up. In the absence of adequate measures, we estimate an increase of prevalence.

At the initial evaluation, excess in body weight predominated in boys (44.1%), being significantly higher compared to girls (29.1%). Similar results were recently obtained by Greek researchers (Kotanidou et al., 2013), but in their case the difference in excess weight prevalence between genders was less than 3%.

When we used the whole group, evolution of z-scores of BMI for age was not influenced by time or gender. Children who were overweight at follow-up had significantly lower z-scores of BMI for age at the initial evaluation, while all other categories (underweight, normal weight and obese) had similar mean z-scores at the initial evaluation and follow-up. The explanation for the significant difference of z-scores of BMI-for age in overweight children at follow-up, when compared to initial values, is that in our sample the major shift was from normal weight to overweight. For children who were obese at follow-up, there was no significant change in mean z-scores, implying the fact that children who were obese by the time they finished primary school were already obese when they started

Table IV

Difference in weight and height per month by initial BMI categories.

BMI Categories	Difference in weight/month[1]			Difference in height/month[2]		
	Mean +/- Std. Deviation	95% Confidence Interval for Mean		Mean +/- Std. Deviation	95% Confidence Interval for Mean	
		Lower Bound	Upper Bound		Lower Bound	Upper Bound
< -1 SD (n=15)	.280 +/- .0793	.236	.323	.462 +/- .1094	.402	.523
(-1; 1) SD (reference) (n=76)	.293 +/- .0981	.271	.316	.487 +/- .1163	.460	.513
(1; 2) SD (n=21)	.397* +/- .1278	.339	.455	.505 +/- .0884	.465	.545
> 2 SD (n=11)	.401* +/- .1134	.325	.477	.467 +/- .0910	.406	.529
Total (n=123)	.319 +/- .1123	.299	.339	.485 +/- .1087	.466	.504
Total (n=123)	.319 +/- .1123	.299	.339	.485 +/- .1087	.466	.504

[1] Calculated as [(Final weight-Initial weight)/ follow-up months]

[2] Calculated as [(Final height-Initial height)/ follow-up months]

*Sig difference $p<0.05$, compared to reference

primary school. These results underline the importance of starting weight interventions even before primary school, in kindergarten.

Although the z-scores of BMI-for-age did not statistically significantly change between the initial evaluation and follow-up, we consider that the rise in overweight and obesity prevalence is clinically significant, because it demonstrates a continuous increase in prevalence in the absence of interventions targeted to tackle obesity.

At follow-up, there was a significant difference between boys and girls related to distribution to BMI categories, boys being distributed to higher categories, with a small effect size.

In order to standardize growth rate by months of follow-up, we calculated a growth rate for weight and height per month, although it is clear that the children's growth rate is not constant during the year. We demonstrated that growth in kg per month was significantly higher in overweight (mean growth=0.397 kg/month) and obese (mean growth=0.402 kg/month) compared to normal weight children at the initial evaluation (mean growth=0.294 kg/month). Growth in kilograms per month was not statistically significant between the normal weight and underweight categories (mean growth=0.280 kg/month).

The growth rate in length per month was not statistically significant between initial BMI categories. Gender did not influence the weight or height growth rate.

These results offer an explanation for the rise in overweight and obesity prevalence between age groups in children, as seen in several pan-European trials (Wijnhoven et al., 2014; Wijnhoven et al., 2013; Ogden et al., 2012), children with excess in body weight being prone to accumulate more weight, compared to normal weight children.

Conclusions

1. We found out that children who are overweight and obese by the time they are in primary school have a high risk of maintaining this unhealthy weight and even accumulate more unhealthy weight by the time they finish primary school, unless they receive interventions targeted for healthy living, calories control and increase in physical activities.

2. Our findings from this pilot study can motivate and offer a background for the development of lifestyle interventions that can be implemented in kindergartens and schools, with the aim of reducing overweight and obesity prevalence.

Conflicts of interests

The authors declare no conflict of interests.

Acknowledgments

This study received no sponsorship.

The results presented in this paper are partial results of current PhD studies undertaken by Dr. Banu Ancuța-Mioara at the Victor Babes University of Medicine and Pharmacy Timisoara.

References

Bac A, Woźniacka R, Matusik S et al. Prevalence of overweight and obesity in children aged 6-13 years—alarming increase in obesity in Cracow, Poland. Eur J Pediatr 2012;171(2):245-251. doi: 10.1007/s00431-011-1519-1.

Brettschneidera AK, Schaffrath Rosario A, Kuhnert R et al. Updated prevalence rates of overweight and obesity in 11- to 17-year-old adolescents in Germany. Results from the telephone-based KiGGS Wave 1 after correction for bias in self-reports BMC Public Health. 2015;15:1101. doi: 10.1186/s12889-015-2467-x.

Field AE, Cook NR, Gillman MW. Weight status in childhood as a predictor of becoming overweight or hypertensive in early adulthood. Obes Res. 2005;13(1):163-169. doi: 10.1038/oby.2005.21.

Finucane MM, Stevens GA, Cowan MJ et al. National, regional, and global trends in body-mass index since 1980: systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9·1 million participants. The Lancet 2011;377(9765):557-567; http://dx.doi.org/10.1016/S0140-6736(10)62037-5.

Kelsey MM, Zaepfel A, Bjornstad P, Nadeau KJ. Age-related consequences of childhood obesity. Gerontology, 2014;60(3):222-228. doi: 10.1159/000356023.

Kotanidou EP, Grammatikopoulou MG, Spiliotis BE et al. Ten-year obesity and overweight prevalence in Greek children: a systematic review and meta-analysis of 2001-2010 data. Hormones (Athens). 2013;12(4):537-549. DOI: 10.14310/horm.2002.1442.

Moss A, Klenk J, Simon K et al. Declining prevalence rates for overweight and obesity in German children starting school. Eur J Pediatr. 2012;171(2):289-299 doi:10.1007/s00431-011-1531-5.

Ng M, Fleming T, Robinson M et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet 2014;384 (9945):766-781. doi: 10.1016/S0140-6736(14)60460-8. Erratum in: Lancet 2014;384(9945):746.

Ogden CL, Carroll MD, Kit BK et al. Prevalence of Obesity and Trends in Body Mass Index Among US Children and Adolescents, 1999-2010. JAMA. 2012;307(5):483-490. doi:10.1001/jama.2012.4.

Petkeviciene J, Klumbiene J, Kriaucioniene V, Raskiliene A, Sakyte E, Ceponiene I. Anthropometric measurements in childhood and prediction of cardiovascular risk factors in adulthood: Kaunas cardiovascular risk cohort study. BMC Public Health. 2015;15:218. doi: 10.1186/s12889-015-1528-5.

Riedel C, von Kries R, Buyken AE, Diethelm K, Keil T, Grabenhenrich L, Müller MJ, Plachta-Danielzik S. Overweight in adolescence can be predicted at age 6 years: a CART analysis in German cohorts. PLoS One. 2014;9(3):e93581. doi: 10.1371/journal.pone.0093581.

Whitaker RC, Dietz WH. Role of the prenatal environment in the development of obesity. J Pediatr 1998;132(5):768-776. http://dx.doi.org/10.1016/S0022-3476(98)70302-6.

Wijnhoven T, van Raaij J, Spinelli A et al. WHO European Childhood Obesity Surveillance Initiative: body mass index and level of overweight among 6-9-year-old children from school year 2007/2008 to school year 2009/2010. BMC Public Health. 2014;14:806. DOI: 10.1186/1471-2458-14-806.

Wijnhoven TMA, van Raaij JMA, Spinelli A et al. WHO European Childhood Obesity Surveillance Initiative 2008: weight, height and body mass index in 6–9-year-old children. Pediatr Obes, 2013;8:79-97. doi: 10.1111/j.2047-6310.2012.00090.x.

Websites

(1) www.who.int/childgrowth/software/en/ Accessed on 5 April 2016.

Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 4, October-December 2016, 274–278

The anthropometric profile of junior handball players (Note II)

Profilul antropometric al jucătorilor de handbal juniori (Nota II)

Cristian Potoră [1], Nikolaos Mavritsakis [2,3], Simona Tache [1]
[1] Iuliu Haţieganu University of Medicine and Pharmacy, Cluj-Napoca, Department of Biosciences, Physiology
[2] 1 December 1918 University of Alba Iulia, Department of Physical Education and Sport
[3] The Geriatrics and Gerontology Centre, Alba Iulia

Abstract
Background. Specific hand anthropometric parameters might influence performance and could be useful for the selection and identification of talents among junior handball players.
Aims. We aimed to study the effect of maturation on specific anthropometric variables – hand span as a static parameter and hand grip strength as a dynamic parameter, in handball players and non-athletes.
Methods. The specific anthropometric variables determined by direct methods were the following: hand grip strength as a dynamic parameter; hand span as a static parameter.
Results. Specific hand anthropometric parameters increase significantly with age. Hand grip strength and hand span are significantly increased in athletes compared to non-athletes.
Conclusions. Specific anthropometric parameters measured in junior handball players can be used for the identification of talents in grip sports and for tertiary selection.
Key words: junior handball players, specific anthropometric variables, grip sports.

Rezumat
Premize. Indicatorii antropometrici specifici de la nivelul mâinii ar putea influenţa performanţele şi ar putea fi utile pentru selecţia şi identificarea talentelor la handbaliştii juniori.
Obiective. Ne-am propus să studiem şi efectul maturizării asupra indicatorilor antropometrici specifici - anvergura mâinii ca indicator static şi forţa de contracţie a flexorilor palmari ca indicator dinamic, la sportivii handbalişti şi nesportivi.
Metode. Indicatorii antropometrici specifici determinaţi prin metode directe au fost următorii: forţa de contracţie a muşchilor flexori palmari ca indicator dinamic; anvergura palmară ca indicator static
Rezultate. Indicatorii antropometrici specifici mâinii sunt diferiţi la jucătorii de handbal juniori faţă de nesportivi. Indicatorii antropometrici specifici mâinii cresc semnificativ cu vârsta. Forţa de contracţie a muşchilor flexori palmari şi anvergura mâinii sunt crescute semnificativ la sportivi faţă de nesportivi.
Concluzii. Indicatorii antropometrici specifici determinaţi la handbaliştii juniori pot fi utilizaţi pentru identificarea talentelor în sporturile grip şi pentru selecţia terţiară.
Cuvinte cheie: jucători de handbal juniori, indicatori antropometrici specifici, grip sports.

Introduction

Sports can be divided into two categories in terms of grasping with the hands: grip and non-grip sports (Fallahi & Jadidian, 2011). The hand, particularly the flexors, can be used to throw, to prehend (grab, grasp, seize), to hit in grip sports:

- ball sports (basketball, baseball, handball, volleyball, rugby);
- climbing sports (rock climbing);
- combat sports (boxing, wrestling, judo) – ground bearing sports (gymnastics);
- paddle sports (kayaking, canoeing) – equestrian sports (horseback riding);
- racket sports (tennis, table tennis, badminton) – weapon sports (fencing) – club sports (golf);
- snatch sports (weightlifting).

A number of studies have investigated, in addition to basic anthropometric parameters (height, weight, BMI, circumferences and diameters), specific anthropometric parameters (finger length, palm width, palm diameter, palmar surface, hand grip strength) in different grip sports.

In handball players, studies on specific anthropometric parameters have focused on:

Received: 2016, September 12; *Accepted for publication:* 2016, September 29;
Address for correspondence: 400192 Cluj-Napoca, Ştefan cel Mare Square no. 4, tel. 40-(0)264-594672, fax. 40-(0)264-592832
E-mail: cristipotora@gmail.com
Corresponding author: Cristian Potoră, cristipotora@gmail.com

- hand size (Mc Laine, 2010; Fallahi & Jadidian, 2011; Zapartidis et al., 2009a; Zapartidis et al., 2009b; Zapartidis et al., 2011);
- intra- and interindividual population variability (Mc Laine, 2010; Barut et al., 2008);
- hand grip strength depending on the playing position in the team (Vila et al., 2012), the level of training (Hermassi et al., 2010; Hermassi et al., 2010) and sex (Barut et al., 2008);
- specific motor skills (Visnapuu & Jürimäe, 2009);
- various ball grip sports (Barut et al., 2008);
- role of the dominant hand (Fallahi & Jadidian, 2011);
- predictive role of anthropometric parameters (Debanne & Laffaye, 2011);
- influence of body composition on anthropometric parameters (Jürimäe et al., 2009).

Hypothesis

Given the importance of basic anthropometric parameters in determining the anthropometric profile of junior handball players (Note I, Potora et al., 2016), we aimed to study the effect of maturation on specific anthropometric parameters – hand span as a static parameter and hand grip strength as a dynamic parameter in handball players and non-athletes.

Material and methods

The research was carried out with the approval of the Cluj County School Inspectorate, with the subjects' informed consent, the consent obtained from the subjects' parents, and the approval of the sports medicine doctor at the *George Coşbuc* National College in Cluj-Napoca.

Research protocol

a) Period and place of the research

The specific anthropometric parameters of athletes in the experimental groups E1, E2, E3 and in the control groups C1, C2, C3 were determined for each group in October 2015.

Studies were carried out at the school medical office of the *George Coşbuc* National College in Cluj-Napoca and at the medical office of the Sports High School in Cluj.

b) Subjects and groups

The research was conducted in 6 groups of subjects, each consisting of 10 subjects.

The experimental groups (E) included professional athletes from the Sports High School Cluj and the Potaissa Handbal Club Association Turda, and the control groups (C) were formed by pupils from the *George Coşbuc* National College in Cluj-Napoca, as follows:

C1 – subjects born in 1997, aged 18.77 ± 0.26
C2 – subjects born in 1998, aged 17.57 ± 0.19
C3 – subjects born in 1999, aged 16.88 ± 0.25
E1 – subjects born in 1997, aged 18.72 ± 0.26
E2 – subjects born in 1998, aged 17.24 ± 0.38
E3 – subjects born in 1999, aged 16.47 ± 0.17

The weekly training program of groups C consisted of general physical training 1-2 hours/week, while the weekly training of groups E consisted of specific physical training 1.5-2 hours/day, 5 days/week.

c) Tests applied

The specific anthropometric variables determined by direct methods were the following (Cordun, 2009; Neagu, 2014):

- *hand grip strength as a dynamic parameter*, measured with a FA-100 mechanical dynamometer and expressed in kgf;
- *hand span as a static parameter*, measured with an anthropometric compass and expressed in cm.

d) Statistical processing

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

Results

a) Hand grip strength (Tables I and II)

The statistical analysis of *left hand grip strength*, *considering all six groups,* showed statistically significant differences between at least two of the groups ($p < 0.001$). The statistical analysis of the values of *left hand grip strength*, *considering all control groups,* evidenced no statistically significant differences between the groups ($p > 0.05$). The statistical analysis of the values of *left hand grip strength*, *considering all groups of athletes,* revealed no statistically significant differences between the groups ($p > 0.05$).

The statistical analysis of the values of *right hand grip strength*, *considering all six groups,* indicated statistically significant differences between at least two of the groups ($p < 0.001$). The statistical analysis of the values of *right hand grip strength*, *considering all control groups,* showed no statistically significant differences between the groups ($p > 0.05$). The statistical analysis of the values of *right hand grip strength*, *considering all groups of athletes,* indicated no statistically significant differences between the groups ($p > 0.05$).

Table I

Comparative analysis of left hand grip strength vs. right hand grip strength (kgf) in the studied groups and statistical significance.

Hand	Group	Mean	SE	Median	SD	Min	Max	Statistical significance (p)			
Left	C1	27.20	1.5261	27.00	4.8259	20	34	C+E	**< 0.0001**	E1-E2	0.8938
	C2	25.20	1.2000	26.00	3.7947	20	32	C1-C2-C3	0.0996	E1-E3	0.4385
	C3	23.00	1.0000	22.00	3.1623	20	30	E1-E2-E3	0.7263	E2-E3	0.5137
	E1	35.40	3.2393	32.00	10.2437	20	54	C1-C2	0.3173	C1-E1	**0.0394**
	E2	36.00	3.0258	36.00	9.5685	20	54	C1-C3	**0.0488**	C2-E2	**0.0061**
	E3	38.40	1.9276	37.00	6.0955	30	52	C2-C3	0.1792	C3-E3	**< 0.0001**
Right	C1	30.80	1.4667	32.00	4.6380	22	36	C+E	**< 0.0001**	E1-E2	0.8105
	C2	27.20	1.6384	25.00	5.1812	22	38	C1-C2-C3	0.0578	E1-E3	0.8486
	C3	25.60	1.2579	24.00	3.9777	22	34	E1-E2-E3	0.9644	E2-E3	0.9303
	E1	41.80	3.2448	41.00	10.2610	24	60	C1-C2	0.1190	C1-E1	**0.0086**
	E2	43.00	3.7148	42.00	11.7473	20	64	C1-C3	**0.0199**	C2-E2	**0.0021**
	E3	42.60	2.5482	42.00	8.0581	34	58	C2-C3	0.5069	C3-E3	**< 0.0001**

The statistical analysis of the values of *hand grip strength for unpaired samples* demonstrated:

- *in the left hand*: statistically significant differences between groups C1-C3 ($p < 0.05$); statistically significant differences between groups C3-E3 ($p < 0.001$), statistically significant differences between groups C2-E2 ($p < 0.01$) and statistically significant differences between groups C1-E1 ($p < 0.05$);

- *in the right hand*: statistically significant differences between groups C1-C3 ($p < 0.05$); statistically significant differences between groups C3-E3 ($p < 0.001$) and statistically significant differences between groups C1-E1 and C2-E2 ($p < 0.01$).

The statistical analysis of the values of *left hand grip strength* compared to those of *right hand grip strength* showed no statistically significant differences for any of the groups ($p > 0.05$).

Table II

Left hand grip strength vs. right hand grip strength in the studied groups – statistical significance.

Time	Statistical significance (p)					
Group	C1	C2	C3	E1	E2	E3
p	0.1062	0.3394	0.1024	0.1797	0.1622	0.2061

b) Hand span (Table III)

The statistical analysis of the values of *left hand span*, *considering all six groups,* evidenced statistically significant differences between at least two of the groups ($p < 0.001$). The statistical analysis of the values of *left hand span*, *considering all control groups,* showed statistically significant differences between at least two of the groups ($p < 0.01$). The statistical analysis of the values of *left hand span*, *considering all groups of athletes,* indicated statistically significant differences between at least two of the groups ($p < 0.01$).

The statistical analysis of the values of *right hand span*, *considering all six groups,* showed statistically significant differences between at least two of the groups ($p < 0.001$). The statistical analysis of the values of *right hand span*, *considering all control groups,* demonstrated statistically significant differences between at least two of the groups ($p < 0.01$). The statistical analysis of the values of *right hand span*, *considering all groups of athletes,* revealed statistically significant differences between at least two of the groups ($p < 0.01$).

The statistical analysis of the values of *hand span for unpaired samples* revealed the following:

- *in the left hand*: statistically significant differences between groups E1-E3, C1-E1, C2-E2, C3-E3 ($p < 0.001$); statistically significant differences between groups C1-C3 ($p < 0.01$); statistically significant differences between groups C1-C2, E2-E3 ($p < 0.05$);

- *in the right hand*: statistically significant differences between groups E1-E3, C1-E1, C2-E2, C3-E3 ($p < 0.001$); statistically significant differences between groups C1-C3 ($p < 0.01$); statistically significant differences between groups C1-C2, E1-E2, E2-E3 ($p < 0.05$);

- *in the left hand vs. the right hand* – no statistically significant differences in any of the groups ($p > 0.05$).

c) Correlations between the studied parameters (Table IV)

For group C1, very good positive correlations between LHGS – RHGS, LHS – RHS

For groups C2 and C3, very good positive correlations between LHGS – RHGS, LHS – RHS; acceptable positive correlations between LHGS – LHS, RHGS – RHS

For group E1, very good positive correlations between LHGS – RHGS; good positive correlations between LHS – RHS

For group E2, very good positive correlations between LHS – RHS; good positive correlations between LHGS – RHGS; good negative correlations between LHGS – LHS, RHGS – RHS

For groups E3, very good positive correlations between LHGS – RHGS, LHS – RHS; good negative correlations between LHGS – LHS, RHGS – RHS.

Table III

Left hand span vs. right hand span in the studied groups and statistical significance.

Hand	Group	Mean	SE	Median	SD	Min	Max	Statistical significance (p)				
Left	C1	23.75	0.2272	23.90	0.7184	22.7	24.8	C+E	**< 0.0001**	E1-E2	0.0590	C1 (LH-RH)
	C2	22.99	0.2312	23.10	0.7310	22	24.2	C1-C2-C3	**0.0017**	E1-E3	**0.0001**	0.5904
	C3	22.23	0.3297	22.05	1.0425	20.8	24	E1-E2-E3	**0.0014**	E2-E3	**0.0271**	C2 (LH-RH)
	E1	28.15	0.4083	28.00	1.2912	26.2	29.7	C1-C2	**0.0307**	C1-E1	**1.96×10^{-7}**	0.7015
	E2	26.72	0.4173	27.20	1.3198	24.5	28	C1-C3	**0.0016**	C2-E2	**< 0.0001**	C3 (LH-RH)
	E3	25.21	0.4347	25.00	1.3747	23.6	27	C2-C3	0.0774	C3-E3	**4.22×10^{-5}**	0.7681
Right	C1	23.94	0.2029	24.10	0.6415	22.4	24.6	C+E	**< 0.0001**	E1-E2	**0.0335**	E1 (LH-RH)
	C2	23.12	0.2407	23.10	0.7613	21.9	24.3	C1-C2-C3	**0.0032**	E1-E3	**0.0004**	0.6162
	C3	22.37	0.3317	22.15	1.0489	21	24.2	E1-E2-E3	**0.0012**	E2-E3	**0.0242**	E2 (LH-RH)
	E1	28.41	0.4496	29.00	1.4216	26.4	29.8	C1-C2	**0.0133**	C1-E1	**< 0.0001**	0.6691
	E2	26.79	0.4403	27.35	1.3924	24.7	28.2	C1-C3	**0.0028**	C2-E2	**< 0.0001**	E3 (LH-RH)
	E3	25.28	0.4192	25.15	1.3256	23.8	27	C2-C3	0.0859	C3-E3	**0.0004**	0.8676

Table IV

Statistical correlation analysis between grip strength and hand span values in the studied groups.

Indicators \ Group		C1		C2		C3		E1		E2		E3	
LHGS	RHGS	0.8459	****	0.8680	****	0.9968	****	0.7894	****	0.7078	***	0.8451	****
GS - HS	LH	-0.2051	*	0.3493	**	0.2907	**	0.1201	*	-0.5821	***	-0.5203	***
	RH	0.1988	*	0.2580	**	0.3044	**	0.1651	*	-0.5474	***	-0.5321	***
LHS	RHS	0.7693	****	0.9808	****	0.9978	****	0.7239	***	0.9969	****	0.9605	****

Legend: *LHGS = left hand grip strength; RHGS = right hand grip strength; LHS = left hand span; RHS = right hand span*

Discussions

Our results show that grip strength in both hands is significantly increased in 16-17 and 18-year-old handball players compared to non-athletes. For the non-athlete groups, significant increases in 18-year-old compared to 16-year-old subjects were observed regarding grip strength in both hands. The highest values of grip strength were found in the right hand in both handball players and non-athletes, which could be due to the fact that this is the dominant hand. The high values of grip strength at the age of 18 compared to age 16 can be attributed to biological maturation.

Hand span, which was not studied by other authors, was significantly increased in both hands in 16-17 and 18-year-old handball players compared to non-athletes, with the highest values at the age of 18.

The correlation analysis between grip strength in both hands shows good and very good positive correlations in both groups C and groups E. The correlation analysis between grip strength and hand span values evidences good and very good positive correlations for all groups C, and good negative correlations for the 16 and 17-year-old groups. The correlation values of the right hand and left hand span were very good and positive both in junior handball players and in control groups aged 16, 17 and 18 years old.

Our results regarding the increase of specific anthropometric parameters in 16-18-year-old junior handball players are in agreement with the observations of Fallahi & Jadidian (2011) regarding the importance of hand grip strength in athletes, handball players, compared to non-athletes, which is correlated with hand span and finger length.

Regarding the role of anthropometric parameters and motor skills, some authors support that these are relatively stable predictors (Visnapuu & Jürimäe, 2009). In contrast, other authors support the importance of anthropometric measurements in the test battery for junior handball players (Zapartidis et al., 2009a; Zapartidis et al., 2009b; Zapartidis et al., 2011; Barut et al., 2008) and the better predictive role of basic anthropometric parameters compared to specific anthropometric parameters (Debanne & Laffaye, 2011).

The determination of specific hand anthropometric parameters can be useful in grip sports and for the identification of talents (Clerke et al., 2005), as well as for hand treatment and rehabilitation strategies (Ghandhi & Singh, 2010, cited by Fallahi & Jadidian, 2011), in neuromuscular disorders - arteritis (Wiles et al., 1990), for the assessment of nutrition status (Fallahi & Jadidian, 2011), post-surgery complications (Wang et al., 2010).

Conclusions

1. Specific hand anthropometric parameters are different in junior handball players compared to non-athletes: grip strength and hand span are significantly increased in athletes compared to non-athletes.

2. Specific hand anthropometric parameters significantly increase with age in junior handball players.

3. Right hand and left hand grip strength is correlated with hand span values both in junior handball players and non-athletes.

4. The values of specific anthropometric parameters measured in junior handball players can be used for the identification of talents in grip sports and for tertiary selection.

Conflicts of interests

There are no conflicts of interest.

Acknowledgments

The paper is part of the first author's doctoral thesis, in progress at the *Iuliu Haţieganu* University of Medicine and Pharmacy in Cluj-Napoca.

References

Barut C, Demirel P, Kiran S. Evaluation of hand anthropometric measurements and grip strength in basketball, volleyball and handbal players. Anatomy 2008, 2:55-59. doi:10.2399/ana.08.055

Chelly MS, Hermassi S, Shephard RJ. Relationships between power and strength of the upper and lower limb muscles and throwing velocity in male handball players. J Strength Cond Res 2010;24:1480-1487.

Clerke AM, Clerke JP, Adams RD. Effects of hand shape on maximal isometric grip strength and its reliability in teennagers. J Hand Ther, 2005;18(1):19-29.

Cordun M.Kinantropometria. Ed. CD Press. Bucureşti, 2009.

Debanne T, Laffaye G. Predicting the throwing velocity of the ball in handball with anthropometric variables and isotonic tests. J Sports Sci. 2011;29(7):705-713. doi: 10.1080/02640414.2011.552112.

Fallahi A, Jadidian A. The effect of hand dimensions, hand shape and some anthropometric characteristics on handgrip strength in male grip athletes and non-athletes. Journal of Human Kinetics. The Journal of Academy of Physical Education in Katowice. 2011;29;(SEP):151-159. DOI: https://doi.org/10.2478/v10078-011-0049-2.

Fallahi AA, Jadidian AA. The effect of hand dimensions, hand shape and some anthropometric characteristics on handgrip strength in male grip athletes and non-athletes. J Hum Kinet. 2011;29:151-159. doi: 10.2478/v10078-011-0049-2.

Gandhi M, Koley S, Sandhu JS. Association between anthropometric characteristics and physical strength in school going children of Amritsar. Anthropologist. 2010;12(1):35-39.

Hermassi S, van den Tillaar R, Khlifa R, Chelly MS, Chamari K. Comparison of in-season-specific resistance vs. A regular throwing training program on throwing velocity, anthropometry, and power performance in elite handball players. J Strength Cond Res. 2015;29(8):2105-2114. doi: 10.1519/JSC.0000000000000855.

Hurbo T, Jürimäe J. Relationship of handgrip strength with anthropometric and body composition variables in prepubertal children. HOMO – J Comparat Hum Biol. 2009;60(3):225-238.

Jürimäe T, Hurbo T, Jürimäe J. Relationship of handgrip strength with anthropometric and body composition variables in prepubertal children. Homo. 2009;60(3):225-238. doi: 10.1016/j.jchb.2008.05.004. Epub 2008 Nov 8.

McLain T. The use of factor analysis in the development of hand sizes for glove design. A thesis presented to the Faculty of the Graduate College at the University of Nebraska. In partial fulfillment of requirements for the Degree of Master of Science. Lincoln, Nebraska, May, 2010.

Neagu N. Biometrie u mană Vol. I - Antropometria. Ed. University Press, Târgu-Mureş, 2014.

Potora C, Mavritsakis N, Tache S. The anthropometric profile of junior handball players (Note I). Palestrica of the third millennium-Civilization and sport, 2016;17(4):paginile.

Vila H, Manchado C, Rodriguez N, Abraldes JA, Alcaraz PE, Ferragut C. Anthropometric profile, vertical jump, and throwing velocity in elite female handball players by playing positions. J Strength Cond Res. 2012;26(8):2146-2155. doi: 10.1519/JSC.0b013e31823b0a46.

Visnapuu M, Jürimäe T. Relations of anthropometric parameters with scores on basic and specific motor tasks in young handball players. Percept Mot Skills. 2009;108(3):670-676.

Visnapuu M, Jürimäe T. Handgrip strength and hand dimensions in young handball and basketball players. J Strength Cond Res. 2007;21(3):923-929.

Visnapuu M, Jürimäe T. The influence of basic body and hand anthropometry on the results of different throwing tests in young handball and basketball players. Anthropol Anz, 2008;66(2): 225-236

Wang A, Sanderson JE, Sea Mandy MMei, Wang M, Lam CWK, Chan IHS, Lui SF, Woo J. Handgrip strength, unlike other nutrition parameters, predicts circulatory congestion in peritoneal dialysis patients. Nephrol Dial Transplant, 2010;1-7.

Wiles CM, Karni Y, Nicklin J. Laboratory testing of muscle function in the management of neuromuscular disease. J Neurol Neurosurg & Psychiat, 1990;53:384-387. doi:10.1136/jnnp.53.5.384.

Zapartidis I, Panagiotis K, Christodoulidis T, Skoufas D, Bayios I. Profile of young handball players by playing position and determinants of ball throwing velocity. J Hum Kin, 2011;27(Mar.):17-30. DOI: https://doi.org/10.2478/v10078-011-0002-4.

Zapartidis I, Toganidis T, Vareltzis I, Christodoulidis T, Kororos C, Skoufas P. Profile of young female handball players by playing position. Serbian J Sports Sci. 2009b;3(2): 53-60

Zapartidis I, Vareltzis I, Gouvali M, Kororos P. Physical Fitness and Anthropometric Characteristics in Different Levels of Young Team Handball Players. Open Sports Sci J. 2009a;2(1):22-28.

Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 4, October-December 2016, 279–282

CASE STUDIES

The role of physical exercise therapy in the rehabilitation of a patient with a thoracic spine tumor

Rolul kinetoterapiei în recuperarea unei paciente cu tumoră la nivelul coloanei toracale

Andreea-Marilena Ionescu [1], Marius-Cristian Cojocaru [2]
[1] Physical Medicine and Rehabilitation, Clinical Rehabilitation I Department, Bradet Rehabitation Hospital, Arges County, Romania
[2] Carol Davila University of Medicine and Pharmacy, Bucharest, Romania, Department of Physical Medicine and Rehabilitation

Abstract

Background. Giant cell tumor (myeloplax) of the spine is benign, rare, but very aggressive, with an unknown prognosis. Surgery is the election treatment, but, according to its localization, in-patient rehabilitation can have an important role in the healing of these patients.

Aims. The purpose of this study was to evidence the evolution of a female patient diagnosed with a giant cell tumor of the thoracic spine, operated and thereafter sent to the physical medicine rehabilitation service.

Methods. The patient presented to Bradet Rehabilitation Hospital for the rehabilitation of a motor deficit of both lower limbs, self-care and walking deficit, and painful knees. After clinical exam and history taking, we decided that the rehabilitation program should be continued.

Results. The patient's evolution was significantly favorable, with a reduction of disability and the regaining of functional independence.

Conclusions. Continuous kinesiotherapy along with other functional rehabilitation methods and family support demonstrated an important role in the medical and social rehabilitation of this patient.

Key words: giant cell tumor (myeloplax), physiotherapy, kinesiotherapy, Brunnstrom.

Rezumat

Premize. Tumora cu celule gigant (mieloplaxe) a coloanei vertebrale este benignă, rară, dar foarte agresivă, cu prognostic imprevizibil. Chirurgia este tratamentul de elecție, dar, în funcție de localizare, recuperarea poate avea un rol determinant în vindecarea acestor pacienți.

Obiective. Scopul acestui studiu a fost acela de a evidenția evoluția unei paciente diagnosticată cu tumoră cu celule gigant la nivelul coloanei toracale, operată și trimisă ulterior spre serviciile de medicină fizică și reabilitare medicală.

Metode. Pacienta s-a prezentat la Spitalul de Recuperare Brădet pentru recuperarea unui deficit motor al membrelor inferioare, disfuncție de autoîngrijire și mers grad moderat, precum și gonalgii mecanice. În urma anamnezei amănunțite și evaluării clinico-funcționale s-a decis continuarea programului de recuperare.

Rezultate. Evoluția pacientei a fost semnificativ favorabilă, cu diminuarea dizabilității și redobândirea independenței funcționale.

Concluzii. Kinetoterapia în formă continuă alături de celelalte metode de recuperare funcțională și suportul familial au avut un rol determinant în reabilitarea medicală și socială a pacientei.

Cuvinte cheie: tumoră cu celule gigante, fizioterapie, kinetoterapie, Brunnstrom.

Received: 2016, September 3; *Accepted for publication:* 2016, September 19;
Address for correspondence: Bradet Rehabilitation Hospital, Braduleț Locality, Arges County, PC 117145, Romania
E-mail: andreea2a@yahoo.com
Corresponding author: Andreea Marilena Ionescu, andreea2a@yahoo.com

Introduction

Giant cell tumor of the spine is an uncommon but most aggressive benign tumor of the spine with unexpected outcome (Shekhar et al., 2007; Christopher & Edward, 2010). It typically affects the extremities, and when involving the spine, the tumor is predominantly localized in the sacrum. However, it determines significant disability and morbidity (Luther et al., 2008).

Giant cell, also termed myeloplax, is defined as a large cell with multiple nuclei obtained by the confluence of other similar cells. They probably derive from histiocytes within the bone marrow (1).

Giant cell tumor is a benign epiphyseal-metaphyseal bone tumor of young adults aged between 20 and 40 years, which is more or less extensive, but locally aggressive, as described by Nelaton E, a French surgeon, in 1860 (DiGrazia S et al., 2013; Murphey et al., 2008). The tumor is formed around highly vascularized tissue, by large multinuclear cells, known as myeloplaxes. Giant cell tumors of the spine have been described as the most challenging benign bone tumors (McDonald, 1998). Although benign, giant cell tumor shows a tendency for significant bone destruction, local recurrence, and occasionally metastasis.

It is an epiphyseal-metaphyseal bone tumor that is likely to develop in young adults aged 20-40.

In the United States of America and Europe, giant cell tumors represent 5% of all bone tumors and 21% of all benign bone tumors, with a female predominance, the female to male ratio being 1.3-1.5 to 1. It appears that only 5% of giant cell tumors occur in patients who are skeletally immature, while 84% occur in patients older than 19 years (Unni, 1996).

Prognosis remains generally good. However, lung metastases have been cited as the cause of death in 16-25% of the reported cases (Kay et al., 1994).

Hypothesis

This study aimed to manage the changes in physical condition, and disability of a young female patient suffering from a giant cell tumor of the thoracic spine, surgically excised and healed, with palsy of both lower limbs.

Material and methods

The subject's written informed consent was obtained before enrollment in the study.

Research protocol

a) Period and place of the research

On 9.01.2017, the patient presented to Bradet Rehabilitation Hospital for complex rehabilitation of deficits in motor control of the lower limbs, impaired walking, balance and self-care.

b) Subject

We analyzed the case of a 31-year-old female patient with spastic motor deficit of the lower limbs, impaired balance and walking, and moderate disability of self-care and activities of daily living.

By the time she was 18 years old, in May 2003, the patient presented to the Neurosurgery Department of "Bagdasar Arseni" Clinical Emergency Hospital in Bucharest, suffering from vertebral-thoracic pain, motor deficit of the lower limbs, sensitivity deficit, with an insidious onset within the last month. Neurological clinical examination evidenced a patient with impossibility of standing or walking, complete motor deficit of the lower limbs, normal coordination tests, with complete T3 level of sensitivity, and impaired urinary and anal sphincters.

c) Tests applied

Magnetic resonance imaging of the thoracic spine revealed a tumor mass developed from bony structures of the posterior arch of T4 vertebral body. The tumor mass was extended within the medullary space over a 4 centimeter surface, and was compressible on all adjacent structures, including cord compression.

d) Treatment

The tumor was completely excised, and the patient was referred to a rehabilitation center, with complete motor deficit of the lower limbs, independence of micturition control, and T4 level of sensitivity.

The histopathological examination of the tumor mass revealed a giant cell tumor (myeloplax).

Following the first rehabilitation session of four weeks, the patient was progressively mobilized to sitting and walking in the wheelchair, but with urinary retention and important spasticity of the lower limbs. She received baclofen 50 mg per day.

The next rehabilitation session, three months later, revealed a patient with a high degree of adductors, sural triceps and psoas spasticity in both lower limbs, ¾ on Ashworth scale, osteotendinous reflexes were not testable, the level of sensitivity was T4. A urinary tract infection overlapped this hospital presentation. The aims of the rehabilitation program were:

1. Decrease of spasticity
2. Initiation of walking
3. Treatment of urinary tract infection
4. Recovery of sensitivity

Treatment consisted of kinesiotherapy programs, stretching and relaxing techniques, neuro-proprioceptive facilitation techniques (cryotherapy), specific sensitivity recovery techniques, baclofen and antibiotics.

Over the following years, the patient continued the rehabilitation program at home and in hospital 4 times a year. Important postural changes of the spine occurred with the standing position, and as the rehabilitation programs became more complex, the new objectives were:

1. Decrease of spasticity
2. Improvement of walking
3. Improvement of balance
4. Improvement of spine alignment
5. Sensitivity recovery
6. Gain of motor independence
7. Gesture relearning
8. Gain of optimal independence in daily life activities

The rehabilitation techniques included the Brunnstrom method to favor sensorimotor recovery, electrical stimulation, and sensitivity recovery techniques in order to achieve all the complex objectives.

Brunnstrom's kinesiotherapy technique includes:

a) Encouraging whatever movement is possible and building on it, through: strengthening, sensory stimulation, positive reinforcement, verbal feedback, and the use of

reflexes.

b) Treatments will involve tasks that are difficult but achievable. As soon as the task is achieved, new goals will be set. Patients are taught to use the voluntary movement that is available to them to achieve goals/tasks.

c) Movement will be progressed in the correct sequence. Abnormal movement always comes first following injury and there is a normal pattern of recovery before normal patterns of movements are obtained.

d) The Brunnstrom approach acknowledges that before normal movement can be restored, there will be a period of abnormal movement. It is the job of physiotherapists to get their patients through the stages of abnormal movement to achieve normal movement and function.

Electrical stimulation was applied in the same rehabilitation center to reduce spasticity of antagonist muscles, and improve contraction of agonist muscles. For knee pain, we used ultrasound and TENS (transcutaneous electrical nerve stimulation).

Neurotropic medication, B-group vitamins, muscle relaxants, and central antispastic baclofen; special massage techniques were also used.

Results

After 1 year of intense rehabilitation, the patient was able to stand, maintain balance, to walk using assistive walking devices, sensory recovery decreased to L3 level bilaterally, and the patient was able to perform tasks of daily living. Spasticity decreased to 2/4 on Ashworth scale, and baclofen doses were reduced.

Unfortunately, urinary tract infections recurred for another 3 years, although sphincter function was recovered.

In 2009, the patient was 24 years old, and she presented to the usual rehabilitation program with mild spasticity, dysesthesia felt in both calves, free of sphincter impairment, with important hypotonicity of gluteal muscles, and she was able to walk using the Canadian crutch (walking stick). The patient was able to perform most of the activities of daily living. She started to feel pain in her knees.

The patient's last visit in rehabilitation, in our hospital, in January 2017, revealed a 31-year-old female with important cervical hyperlordosis, thoracic scoliosis, with genu recurvatum of both knees while walking using one single crutch, painful knees and calves, and an increase in spasticity when walking. She used no medication, and magnetic resonance imaging showed no signs of locoregional recurrence.

Each of the rehabilitation sessions lasted maximum 3 weeks. The patient continued kinesiotherapy at home, supervised and helped by her family. The patient now has a social life, and has started to look for a job, too.

Discussion

The aims of physiotherapy techniques used for the treatment of spasticity are to favor sensorimotor recovery and gesture relearning and to lead to an optimal independence in daily life activities (2). According to Brunnstrom's concept, the goal of exercise is to strengthen spastic paralysis and the associated reactions to enable the upright position and walking as soon as possible. This technique is especially used in very severe deficiencies where the aim is to avoid the bedridden situation. The Brunnstrom approach emphasizes the ability to recover normal movement by facilitating reflexes, basic muscle synergies and sensory stimulation. This type of treatment will help:

1. Increase muscle strength
2. Stretch tight muscles
3. Regain motor control
4. Recover voluntary movement
5. Improve functional tasks such as sit to stand, walking, reaching, grasping and hand to mouth
6. Improve the sequence of functional activities in order to achieve a specific aim
7. Improve posture
8. Increase independence

The Brunnstrom approach is also based on the principle that the treatment chosen should match the stage of recovery. Furthermore, it recognizes the need for goals set to be achievable. Each goal needs to be attained before further goals are set (Fugl Mayer et al., 2007; Wade et al., 2005). This approach also highlights the importance of verbal and visual commands and repetition to enhance recovery (O`Sullivan, 2007).

Three active principles can be identified for neurological rehabilitation. Electrical stimulation is not used routinely by rehabilitation teams. It allows to reduce the spasticity of antagonist muscles working against stimulated muscles. It participates in improving the strength of contraction of weak muscles, notably in subjects with incomplete paraplegia. Finally, it can be used to improve or replace a functional command (lifting the foot during walking, for example). Nevertheless, electrical stimulation cannot replace basic rehabilitation exercises.

The giant cell tumor of the bone tends to appear in young adults over 20 years old, but the patient we presented was 18 years old at the onset of the disease.

Although benign, these tumors show a tendency for bone destruction, local recurrences, and even metastasis to the lungs, lymph nodes (Connel et al., 1998); however, the patient whose case we describe here has had no recurrences over the last 13 years.

When involving the spine, tumors predominantly occur in the sacrum. They carry a significant potential of disability (Luther et al., 2008), as described above.

Some reports presented only few cases of giant cell tumor of dorsal vertebral body (Rakesh & Rajpal, 2012; Shekhar et al., 2007), as we also describe in this case report.

The involvement of the mobile spine segment is seen in only 1-1.5% of all giant cell cases. Symptoms are common and include back pain, neurological deficit due to compression of the spinal cord, bladder and bowel dysfunction, and structural deformity of the spine. All these signs and symptoms appeared in the case presented above.

Various modalities of treatment are recommended for spinal giant cell tumors such as surgery, radiotherapy, embolization, cryosurgery, cementation, and chemical adjuvants such as phenol or liquid nitrogen. Total en bloc surgical excision is the treatment of choice (Rakesh & Rajpal, 2012), as it was in this patient, followed by continuous rehabilitation.

Conclusions

The findings of this case indicate the important role of early rehabilitation, followed by home rehabilitation, as an alternative to long-term hospitalization. Physiotherapy, especially kinesiotherapy, massage, family support all together helped the patient to:

1. Improve walking
2. Decrease spasticity
3. Recover sensorimotor function
4. Improve spinal alignment
5. Gain control on activities of daily living and social life

Conflicts of interest

There are no conflicts of interests.

References

Christopher M, Edward FM. Giant cell tumor of the sacrum and spine: series of 23 cases and a review of the literature. Iowa Orthop J. 2010; 30: 69-75.

Connel D, Munk PL, Lee MJ, O`Connel JX, Janzen D, Vu M, Masri B. Giant cell tumor of bone with selective metastases to mediastinal lymph nodes. Skeletal Radiol. 1998;27(6):341-345.

Di Grazia S, Succi G, Fragetta F, Perrotta RE. Giant cell tumor of tendon sheath: a study of 64 cases and review of literature. G Chir. 2013; 34(5-6): 149-152.

Fugl-Meyer AR, Jääskö,L, Leyman I, Olsson S, Steglind S. The post-stroke hemiplegic patient. A method for evaluation of physical performanc. Scandinav J Rehabil Med. 2007; 1: 13–31.

Kay RM, Eckardt JJ, Seeger LL, Mirra JM, Hak DJ Pulmonary metastasis of benign giant cell tumor of bone. Six histologically confirmed cases, including one of spontaneous regression. Clin Orthop. 1994; 302: 219-230.

Luther N, Bilsky MH, Hartl R. Giant cell tumor of the spine. Neurosurg Clin N AM. 2008; 19(1): 49-55.

McDonald SG. Surgery for bone and soft tissue sarcomas. NY: Lippincot Williams & Wilkins. 1998, 756 Nelaton E. Academie de medicine (1860).

Murphey MD, Rhee JH, Lewis RB, Fanburg-Smith JC, Flemming DJ, Walker EA. Pigmented villonodular synovitis: radiologic-pathologic correlation. Radiographs. 2008; 28(5): 1493-1518.

O`Sullivan SB. Stroke: Motor Function. In O`Sullivan SB & Schmitz TJ (Eds). Physical Rehabilitation. Philadelphia: F. A. Davis Company. 2007: 719.

Rakesh R, Rajpal P. Giant cell tumor of dorsal vertebral body. J Craniovertebr Junction Spine. 2012; 3(2): 67-69.

Shekhar YB, Nene A, Mohite S, Varma R. Giant cell tumor of the spine: a review of 9 surgical interventions in 6 cases. Indian J Orthop. 2007; 41(2): 146-150.

Unni KK. Dahlin`s bone tumors: general aspects and data on 11,087 cases. New York, NY. Lippincott-Raven, 1996, 463.

Wade Derick T, Victorine A, Hewer RL. Recovery after stroke – the first 3 months. J Neurol, Neurosurg & Psych. 2005; 48(1): 7-13.

Websites

(1) http://www.physio.co.uk/treatments/neurological-rehabilitation/the-brunnstrom-approach.php. Accessed in September 2016.

(2) https://www.saebo.com/the-stages-of-stroke-recovery/. Accessed in September 2016.

Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 4, October-December 2016, 283–289

REVIEWS

An epigenetic approach of the symbiotic relationship between nutrition and systematic physical activity

O abordare epigenetică a relaţiei simbiotice dintre nutriţie şi activitatea fizică sistematică

Nicolae Neagu
University of Medicine and Pharmacy, Tîrgu Mureş

Abstract

Our study starts from the assumption that the influence of the environment (phenotype) can modify, positively or negatively, genetic heritage, as an epigenetic factor. Recent research reveals several cellular mechanisms by which environmental influences can control gene activity. These mechanisms (epigenetic activity) allow body cells to adapt to environmental changes. We investigated the literature to clarify some terms: epigenetics, genome, epigenome, microbiome, less circulated in our area, as well as the relationship of mutual potentiation between genotype and phenotype as co-variants of motor capacity, body morphotype and homeostasis. From the relation between individual nutrition and the typology of daily activities, we developed several deductions and analogies, considering that a monitored correlation mutually potentiates the influences of the two environmental factors. Our approach raises the problem whether epigenetics could answer the original question if environmental changes in ancestors generate epigenetic changes in their descendants, inducing a new epigenome, better or worse than the previous one.

Key words: epigenetics, genotype, phenotype, genome, microbiome.

Rezumat

Studiul nostru porneşte de la premiza posibilităţii că influenţa mediului ambiental (fenotipul) poate modifica, pozitiv sau negativ, zestrea genetică individuală, ca factor epigenetic. Cercetări recente relevă că există mecanisme celulare, prin care influenţele ambientale pot controla activitatea genelor. Aceste mecanisme, ca activitate epigenetică, dau posibilitatea adaptării celulelor corpului la modificările ambientale. Am investigat literatura de specialitate cu scopul clarificării semantice a unor termeni: epigenetică, genom, epigenom, microbiom, mai rar vehiculaţi în domeniul nostru, respectiv, relaţia de potenţare reciprocă dintre genotip şi fenotip, covariante ale capacităţii motrice, morfotipului somatic şi homeostaziei organismului. Din relaţia dintre caracteristicile dietei individuale şi tipologia activităţilor cotidiene, dezvoltăm deducţii şi analogii, apreciind că o corelare monitorizată potenţează reciproc influenţele celor doi factori ambientali. Abordarea noastră ridică problema dacă epigenetica ar putea răspunde la întrebarea-premiză iniţială şi dacă modificările ambientale longitudinale asupra antecesorilor generează schimbări epigenetice asupra descendenţilor acestora, inducându-le un nou epigenom, superior sau inferior precedentului.

Cuvinte cheie: epigenetică, genotip, fenotip, genom, microbiom.

Introduction

The fact that the entire phylogenetic evolution of the human species was and still is under the influence of two main groups of influence factors is unanimously recognized. These are *internal, endogenous factors and external, exogenous factors*. From another perspective, internal factors are subordinated to the concept of *human genotype*, based on the human species-specific DNA configuration that makes up the *genome* of each individual, while external factors (*human phenotype*) introduce alterations of the human genome organization, without modifying the DNA sequence, generating a particular (individual) form of manifestation, termed *epigenome*.

Consequently, it can be said that the *genome* is a "data library" containing information, the so-called "instruction manual", comprising about 25,000 genes that control everything that happens to an individual (Restian, 2010). On the other hand, the way in which these "instructions" are used, under the considerable influence of the external environment, is a very important interface between the

Received: 2016, November 20; *Accepted for publication:* 2016, December 7;
Address for correspondence: Universitatea de Medicină şi Farmacie Tîrgu Mureş, Str. Gheorghe Marinescu Nr. 38, Tîrgu Mureş, CP 540139, România
E-mail: neagu.nicolae@umftgm.ro
Corresponding author: Nicolae Neagu, neagu.nicolae@umftgm.ro

genome and the environment, inducing a new genomic construct - *ad certum limitatum tempus* - represented by the individual's *epigenome*. In other words, "epigenetic differences between individuals can become heritable across generations" (Ayala & Arp, 2010), with the mention that they are reversible when the specific inducing factors no longer act. It results that epigenetic influence causes changes which:

- induce and support the development and phenotypic variability of the body;
- explain how cell differentiation occurs;
- show that humans are not rigidly genetically determined;
- the genome is a stable component;
- the epigenome is an adaptive component;
- the epigenome updates only those potentialities of the genetic heritage that correspond to current needs.

Regarding these mechanisms, "The epigenome integrates the information encoded in the genome with all the molecular and chemical cues of cellular, extracellular, and environmental origin. Along with the genome, the epigenome instructs the unique gene expression program of each cell type to define its functional identity during development or disease" (Rivera & Ren, 2013, cited by Kanherkar et al., 2014).

The aim of this study is to reveal a number of aspects regarding the way in which the epigenome influences the relationship that we define as *symbiotic* between systematic physical exercise and the characteristics of nutrition in an individual. We do not intend to study in detail the intricate changes in gene organization and restructuring through methylation or other mechanisms – without effective mutations – all induced by epigenetic factors.

In contrast, we wish to analyze some aspects related to the way in which the *genome*, by "reading" epigenetic information, alters a series of characteristics in individuals and their descendants (across two or three generations), under the longitudinal (long lasting) influence – positive or negative – of the environment, such as the quantity and quality of nutrition in relation to the typology of an individual's daily activities, sedentary or active. Possible effects can be defined as either *mutual potentiation* or *mutual disruption*.

Through this study, we wish to draw attention to some increasingly widely spread *mutual disruption* phenomena, which develop insidiously and have a negative influence on the mutual *potentiation* relationship that should be maintained and optimized.

In fact, there are many and varied signs of this true scourge combining a sedentary lifestyle and an unhealthy diet, which has already induced important epigenetic changes that are transmitted to one up to two or three consecutive generations of descendants: infantile obesity, type 2 diabetes mellitus – at increasingly younger ages – cardiovascular diseases, extensive and premature morbidity, a high incidence of mortality due to a deep alteration of the body homeostasis, as a result of a completely inadequate lifestyle including involuntary and paradoxically, voluntary denutrition – tolerated for the "voracious" pleasure of eating without control.

All these are fatefully combined with chronic sedentariness, generated by educational misconceptions and the transformation of daily activities, relating to:

- automation and robotization;
- passive transportation – by car, subway, elevator, escalator, etc.;
- online communication and "pseudo-socialization";
- predominantly electronic games or use of tablets by children;
- insufficient curricular or extra-curricular physical activities;
- early education in the spirit of avoiding effort, followed by the children's refusal to perform physical activities and sports, considered too tiring and straining, etc.

Epigenetics - concept and evolution

Epigenetics emerged as a new science in the early 40's. It was developed by the English biologist

Conrad Hal Waddington (1905-1975). The term *epigenetics* was used for the first time in 1942, in Waddington's book (Waddington, 1942a), *Science and Ethics*. The same year, Waddington (Waddington, 1942b; Waddington, 1942c) published two articles, in which he developed the concept of *epigenetics* following experimental studies related to the influence of environment on the genome. In fact, the pioneer of epigenetics is the German biologist August Weismann (1834-1914), who experimented some environmental influences on the genome in mice. In 1956, Waddington (Waddington, 1956) published a paper in which "he demonstrates the inheritance of some traits acquired by a population, in response to environmental stimuli" (Noble, 2015). Starting from Waddington's new approaches, certain unorthodox formulations are also found, such as: "Epigenetics is a reaction against genetic deficiencies" (Morange, 2005).

Later, in the mid-70's, studies and new approaches of epigenetics developed, which was interpreted as a "control of gene activity, through DNA methylation and alteration of chromatin components" (Morange, 2005).

The epigenetic approaches of Acad. Prof. Dr. Adrian Restian are also interesting. According to him, "Although leading to extraordinary progress, genetics was not able to explain some biological or pathological processes. For example, genetics cannot explain how cell differentiation occurs", from the egg cell to about "200 different types of cells in the body" and "All cells in the human body are derived from the same egg cell and have the same genetic information. All body cells contain the entire genetic information, that is, all have the same genetic potential. However, genetics cannot explain why one cell activates a certain part of genetic information, becoming a neuron, and another cell activates other genetic information, becoming a muscle cell" (Restian, 2010). Adrian Restian also shows that "Genes are normally silent, they only synthesize proteins when they are stimulated by environmental factors, when the synthesis of those proteins is required. And environmental factors act on the genome through the epigenome" (Restian, 2010). Or, "The epigenome is a sort of interface between the environment and the genome" (Leberder, 2001; Bell & Beck, 2010, cited by Restian, 2010).

There are currently many studies that investigate epigenetics, its role, its mechanisms and their transgenerational effects, and transgenerational persistence as new concepts (Paoloni-Giacobino, 2014). A group of researchers at the Washington University demonstrated by personal studies the persistence, across four generations of rats, of epigenetic demethylation phenomena (Anway et al., 2005). At the same time, other pertinent observations show that "generalizations and the temptation to consider epigenetic inheritance as a general rule should be avoided" (Paoloni-Giacobino, 2014). A statistical analysis conducted by *Thomson Reuters Web of Knowledge* regarding the number of studies on epigenetics in the period 1992-2011 evidenced an 850% increase of their number, from about 1000 articles in 1992 to more than 8500 articles in 2011 (Fig. 1).

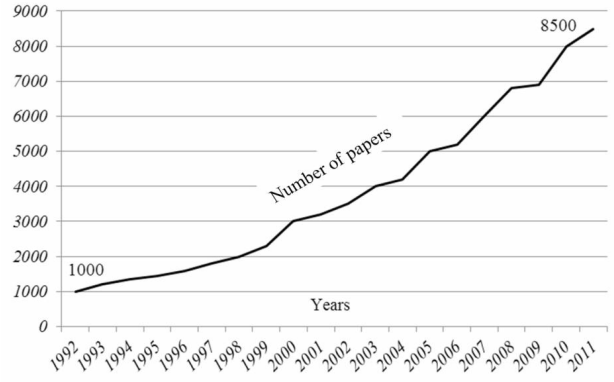


Fig. 1 – Evolution of the number of papers and studies on epigenetics (according to Thomson Reuters Web of Knowledge – Special Topics epigenetics database)

Characteristics of nutrition and its epigenetic impact

A number of studies address the relationship between nutrition as a *sociogenic environmental* factor and its effect on the individual genome, in which it can induce epigenetic changes. The concept of the "first 1000 days of an individual's life" including the prenatal period, and their importance for the epigenetic imprinting of the child's DNA are well known. Relatively recent studies show that inadequate nutrition during pregnancy leads to a marked increase in the rate of non-communicable diseases in offspring (Bedford-Russell & Plumb, 2006; Godfrey et al., 2011; Godfrey et al., 2015; Krushkal et al., 2014). For example, nutritional intake to the fetus through the umbilical cord during pregnancy and in the first months of life has long-term consequences on that individual's health (Godfrey et al., 2015; Tarry-Adkins, 2016).

Lately, the concept of the "first 1000 days" has been extended to a more comprehensive concept, with general applications, the "window of opportunity", which we propose to be included in nutritional guidelines for the mother (with effects on the fetus), and subsequently for the newborn and the child until the age of 3-5 years, which is considered to be the ideal period, with the highest plasticity of the child's development under the influence of environmental factors such as nutrition and physical activity.

The level of an individual's plasticity under external influences decreases with age, which is why a timely phenotypic intervention is important, hence the concept mentioned above. After this optimal period, "the open window" gradually turns into a "closed window against opportunity" or even into a "wall against opportunity", much more difficult to penetrate and influence by environmental factors. Behavioral nutritional or other errors (socioeducational, informational, etc.), translating into nutritional *disorders* or *involuntary denutrition* (through lack of knowledge) and *voluntary denutrition* (out of ignorance), will result in epigenetic marks with long-term negative consequences on the individual's development, as well as on the individual's offspring (Bossdorf et al., 2008).

In various circles interested in the study of epigenetics, with reference to the transmission of genetic predispositions from ancestors to descendants, obesity occupies a central position regarding the interaction between the environment and the individual. *Denutrition* and *sedentariness* are seen as *disturbing obesogenic factors* and the environment becomes an *obesogenic environment*. In such an environment, the epigenetic imprint on the DNA – without changing it (Bird, 2007) – determines a high expression of obesity genes and a low expression of longevity genes. Thus, more than 40 genetic variations have been associated with obesity and adipose tissue distribution (Herrera et al., 2011; Chambers et al., 2008; Lindgren et al., 2009). It was also found, in twins, that the heritability index of the *body mass index* (BMI) in children and adults ranges between 40-70% (Wardle et al., 2008).

Although studies in this area have multiplied, the causal relationship and the covariance relations of the contribution of internal (genetic) and external (environmental) obesogenic factors to what can be defined as *epidemic obesity* are not yet completely understood (Herrera et al., 2011). The same studies show that the specific (more restricted) obesogenic environment has different effects on individuals who live in the same but more extensive environment. Hence certain limitations and hesitations in generalizing one or another hypothesis of obesogenic causality. In fact, this is an extremely wide research area, with many unknown variables, which remain to be discovered and clarified.

Another direction in exploring the study of epigenetics is the development of the concept of *pharmacogenetics*. This involves the discovery of epigenetic drugs, which treat diseases and lead to the inhibition of "disturbing" genes and the activation of "potentiating" genes, offering hope regarding the possibility of "encoding" genes with a triggering role in certain diseases, so that pathogenic genes are silenced (e.g., cancer, morbid obesity, schizophrenia, autism, Alzheimer's disease, type 2 diabetes mellitus, cardiovascular diseases, metabolic disorders and many others). Thus, there is hope that in the future, the DNA will be recoded and adjusted according to the therapeutic and prophylactic needs of tomorrow's society.

Other findings reveal the fact that food acts on the cellular genome through epigenetic factors. In order to be assimilated, food first acts on the cellular genome. The

ingested glucose will initially act on the cellular genome to stimulate the synthesis of insulin and enzymes required for its metabolization. These aspects are investigated by *nutrigenomics,* which studies the influence of nutrition on the cellular genome (Simopoulos, 2002).

Recent studies have shown that inadequate nutrition (high-calorie, high-fat or high-carbohydrate content), smoking and excessive alcohol consumption as environmental factors lead to the development of diseases, acting in turn on epigenetic factors, and that a number of traits can be transmitted across generations through epigenetic factors (Nelson et al., 2010).

Epigenetics, nutrition and the human microbiome

Epigenetic factors, acting on the individual genome, induce changes in gene functions, which impact the different systems of the body. A functional area affected by epigenetic changes is represented by the *individual microbiome* (microbial flora), with long-term effects on the entire digestive activity. The term *microbiome* was introduced by Joshua Lederberg in 2001 (Eisen, 2015). Other relationships, *symbiotic* or, on the contrary, *discordant* can develop auxologically between an individual (as a host) and bacterial and microbial flora (as an epigenetic factor). The result can be positive, ameliorative, optimizing in case of *mutual potentiation* (inducing homeostasis), or obstructive, discordant, antagonistic in case of *mutual disruption* (inducing "dys-stasis") (Fig. 2).

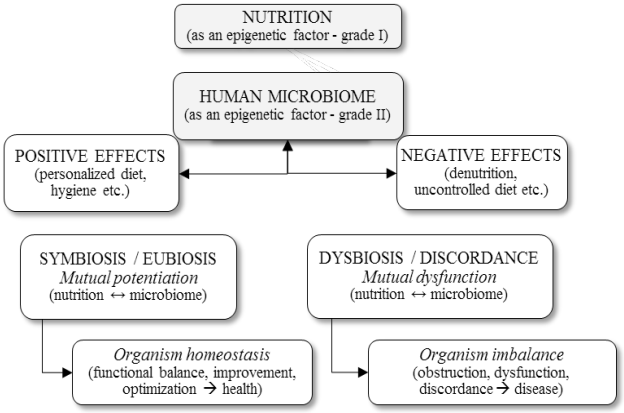


Fig. 2 – Potential influences and relationships between nutrition and the human microbiome, as epigenetic factors.

The human body forms, along with an impressive number of microorganisms - about 100 billion (Kahlert & Müller, 2014), an internal space of cohabitation, generically termed "biozone" or "biocenosis" (biocenosis) – a term introduced by the German biologist Karl August Möbius (1825-1908), in 1877 (Nyhart, 1998). An impressive number of micro-beings "colonize all body-environment interfaces, with genetic information and metabolism, forming the individual human microbiome" (Kahlert & Müller, 2014). In this way, the human body becomes a sort of "superorganism" whose cells "multiply ten times and in terms of genetic information, about 150 times" (Kahlert & Müller, 2014).

The result of this interrelation was defined in 2007 by Eugene Rosenburg and Ilana Zilber-Rosenburg as a *hologenome,* and the theory is termed the *hologenome theory* (Rosenburg et al., 2007; Zilber-Rosenburg et al., 2008). The new resulting functional entity forms a real *holobiosis* between the host organism and its microbiome, and the organism is defined as a *holobiont* (Mustață & Mustață, 2014). Thus, the new gene assembly (host & microorganisms) becomes the *individual hologenome*. The new concept's functioning is based on several rules (Ehrlich et al., 2008; Gilbert et al., 2010):

- Any living organism establishes relationships with internal and environmental microorganisms.
- Microbes are transmitted across generations.
- The interaction between the host organism and microbes influences the interaction of the host with its environment.
- Variations in the individual hologenome are the result of changes in the host genes and microbes (metagenome).

The *microbiome* represents about 2% of an individual's weight. This ratio can be considered low, but through its significant influence on the organism functionality, the microbiome becomes a very important "cohabitant" of the organism. *The microbiome* with its genetic information forms together with the *human genome* an extremely complex *metagenome* (Arumugam et al., 2011).

The colonization of the body by microorganisms occurs progressively. It starts during birth and continues throughout the ontogenic evolution of an individual. In addition to other routes by which this real "army" of microorganisms enter the body (skin, mucosae, respiratory airways, etc.), food is an important "battle tank division" of the microorganism army. Over time, a real "dialogue" takes place between the organism and the microbiome, which has multiple effects, including on the organism's immune system (Salminen, 2005; Stecher & Hardt, 2005; Laparra & Sanz, 2010). This relationship can be *healthy, synchronous* (eubiosis) or *pathogenic, discordant* (dysbiosis) (Fig. 2).

In this context, we mention some recent findings regarding the human organism-microbiome relationship. A group of American researchers at the Washington University found that individuals with a genetic predisposition to obesity have in their intestinal flora bacteria that absorb more nutrients from food. They monitored 12 obese voluntary subjects over a 1-year period, during which these were on a weight loss diet. As the subjects lost weight, the bacterial structure in their intestines changed (Turnbaugh et al., 2006).

The concept of "contagious obesity" has emerged. This means that obesity is not only genetically but also socially transmitted, through an exchange of bacteria between friends and relatives (Christakis & Fowler, 2007; Cohen-Cole & Fletcher, 2008; Bagrowicz et al., 2013).

A recent extensive European project, *MetaHIT* (financed by the European Commission, with a budget of 22 million EURO, implemented in 8 countries in the period 2008-2012), revealed the fact that individuals differ from one another through bacteria in their microbiome (1).

According to recent studies (Arumugam et al., 2011), there are three types of microbial populations, which generate three *human enterotypes,* unrelated to age, sex or diet: *Bacteroides, Prevotella* and *Ruminococcus*.

Bacteroides microbes play a role in carbohydrate breakdown (persons with this enterotype are predisposed to weight problems). *Prevotella* bacteria decompose intestinal mucus, and *Ruminococcus* bacteria enhance sugar absorption, inducing weight gain. Individuals with the *Bacteroides* enterotype have a better synthesis of vitamins B2, B5, C and H, while those with the *Prevotella* enterotype have effective bacteria in synthesizing vitamins B1 and B9 (Slonczewski & Foster; 2011; Rosenburg & Zilber-Rosenburg, 2011) (Fig. 3).

The *Bacteroides* enterotype corresponds to high-fat and high-protein diets, while *Prevotella* is related to a high-carbohydrate diet. As part of the mentioned project, a study in Denmark found that microbiome analysis allows to predict diabetes, the multiplication of *Bacteroides* microbes being more relevant than the *body mass index* (BMI).

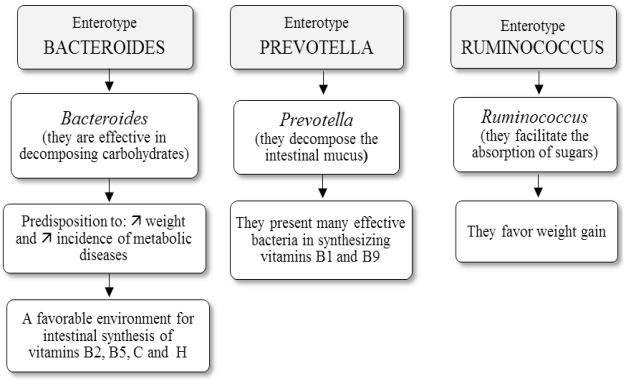


Fig. 3 – The microbiome and human enterotypes (according to the European **MetaHIT** project)

Epigenetics and physical activity

As mentioned before, one of the phenotypic factors that influence the genome and some emerging epigenetic traits is represented by systematic physical activity (longitudinal, in the long term). The positive influences of well conducted personalized physical exercise are known and recognized by most researchers in the field. "Skeptics" are very rarely found when discussing physical exercise based on scientifically verified and validated principles, methods and theories.

We present a number of findings from recent studies in the field of epigenetics.

It was demonstrated that physical exercise performed two times a week for six weeks could alter the methylation of more than 7000 adipose tissues genes (of which 39 involved in obesity and type 2 diabetes mellitus), in a group of 23 middle-aged men, of which 50% had a family history of type 2 diabetes mellitus. Their cells adapted for the benefit of the organism.

Other relevant beneficial effects ($p < 0.05$) were an optimization of individual physical fitness, improved blood pressure and heart rate reactivity during and after exercise, as well as a reduction of cardiovascular risk. The studies were carried out at Lund University, Malmo, Sweden (Rönn et al., 2013).

Other studies show the fact that systematic physical activity has beneficial effects on memory, psychobehavioral balance and impulsivity (Archer et al., 2012; Blum et al., 2015).

Regarding the psyche, the targeted areas are: cognition, affect, personality, behavior, and mental health (Archer, 2015).

One of the many positive effects of systematic physical exercise also acts on the "internal clock", inducing a considerable gap between the biological age and the chronological age of those who are aware of this major benefit. This effect consists of a reversal of the "epigenetic clock" in the aging process (Denham et al., 2013; Lindholm et al., 2015). Physical exercise as an epigenetic factor also contributes to optimizing cardiorespiratory activity and regeneration processes (Zimmer & Bloch, 2015; Kashimoto et al., 2015).

Other studies have demonstrated the fact that systematic physical exercise determines an increase of mitochondrial biogenesis activity in skeletal muscles and an enhancement of biochemical activity during muscle contraction, having beneficial effects on the increase of muscle strength and resistance (Perez-Schindler & Philp, 2015).

Other epigenetic mechanisms influence morphological and functional adaptation in somatic muscles subjected to sustained physical effort. An example is protein *NCoR1* (*nuclear receptor co-repressor* 1), which can reduce the activity of certain genes. Its inhibition induces muscular hypertrophy and an increase in the number of mitochondria, with stimulating effects on physical performance. Potential applications include some positive examples regarding the treatment of myasthenia in the elderly and the development of drugs for obese or immobilized patients, in order to fight physical weakness (Yamamoto, 2011a; Yamamoto, 2011b). However, there are also negative examples, related to the increase, contrary to sports ethics, of muscle strength and resistance in high performance sport (epigenetic doping!!!).

Some studies have evidenced the synergistic relationship between systematic physical exercise and nutrition, as well as the positive effect of personalized diets, which improve various functional disorders, leading to the release of exosomes containing *miRNAs* – non-coding RNA molecules (Tyagi & Joshua, 2014). The Mediterranean diet represents a real benefit for persons with a genetic predisposition to obesity, when it is supported by physical exercise (Ursu et al., 2015). The prerequisites for such positive effects are: longitudinal effort, intensity of effort and frequency of sessions adapted to individual needs and particularities.

Other beneficial effects of the association of exercise with personalized diets have been identified in recent studies: regulation of metabolism, increase of the muscle mass, enhancement of hematopoiesis, and improvement of immunity (Voisin et al., 2015).

Conclusions

Although the area of epigenetics is extremely vast, our study allows us to draw the following conclusions:

1. Epigenetics does not change the DNA and, in addition, we emphasize the idea that epigenetics does not represent an "evolution" in the sense of Darwin's theory.

2. Epigenetic changes are a complex response of the

organism to an external modifying element.

3. The "response" may be inherited and can manifest across generations, through its epigenetic mark.

4. If the epigenetic influence that has generated adaptive changes is removed, the DNA code tends to restore its original program.

5. Environmental factors as epigenetic factors, such as prenatal and postnatal nutrition, stress and the type of activity (physical or sedentary), may leave positive or negative imprints on the generations of descendants, with a higher or lower degree of reversibility, through a reduction or inhibition of the change-inducing actions.

6. Controlled synergism between physical activity and assisted nutrition has many positive effects on the organism, regardless of the individual's status: normal physical fitness, body dysfunction or sports performance.

7. Determining the contribution of endogenous epigenetic factors compared to that of exogenous environmental factors remains an unlimited area to explore, open to further investigations.

Conflicts of interest

Nothing to declare.

Acknowledgments

The study was presented at the National Conference on Sports Nutrition, 2nd Edition, 2-3 November 2016, **Tî**rgu Mureş, Romania. *Organizers*: University of Medicine and Pharmacy Tîrgu Mureş and Romanian Association of Nutrition and Dietetics.

References

Anway MD, Cupp AS, Uzumcu M, Skinner MK. Epigenetic transgenerational actions of endocrine disruptors and male fertility. Science. 2005;308(5727):1466-1469. doi:10.4172/2157-7412.1000115.

Archer T, Oscar-Berman M, Blum K, Gold M. Neurogenetics and Epigenetics in Impulsive Behaviour: Impact on Reward Circuitry. J Genet Syndr Gene Ther. 2012;3(3):1000115. DOI:10.4172/2157-7412.1000115.

Archer T. Physical Exercise as an Epigenetic Factor Determining Behavioral Outcomes. Clin Exp Psychol 2015;1(1). http://dx.doi.org/10.4172/2471-2701.1000e101.

Arumugam M, Raes J, Pelletier E, Le Paslier D, Yamada T, Mende DR, Fernandes GR, Tap J, Bruls T, Batto JM, Bertalan M, Borruel N, Casellas F, Fernandez L, Gautier L, Hansen T, Hattori M, Hayashi T, Kleerebezem M, Kurokawa K, Leclerc M, Levenez F, Manichanh C, Nielsen HB, Nielsen T et al. Enterotypes of the human gut microbiome. Nature, 473(7346):174-180. doi:10.1038/nature09944.

Ayala FJ, Arp R. Contemporary Debates in Philosophy of Biology. Blackwell Publishing Ltd. P.127, Wiley-Blackwell, 2010.

Bagrowicz R, Watanabe C, Umezaki M. Is obesity contagious by way of body image? A study on Japanese female students in the United States. J Comm Health. 2013;38(5):834-837. doi: 10.1007/s10900-013-9686-9.

Bedford Russell AR, Plumb J. GBS and the newborn infant. Infant, 2006;2(6):226-227.

Bell CG, Beck S. The epigenomic interface between genome and environment in common disease, Funct Genom. 2010;9(5-6):477-485. doi: 10.1093/bfgp/elq026.

Bird A. Perceptions of epigenetics. Nature, 2007;447(7143):396-398.

Blum K, Braverman E, Waite RL, Archer T, Thanos PK, Badgaiyan R, Febo M, Dushaj K, Li M, Gold MS. Neuroquantum theories of psychiatric genetics: can physical forces induce epigenetic influence on future genomes? Neuro Quantology, 2015;13(1):90-103. DOI:10.14704/nq.2015.13.1.799.

Bossdorf O, Richards CL, Pigliucci M. Epigenetics for ecologists. Ecol Lett, 2008;11:(2):106-115.

Chambers JC, Elliott P, Zabaneh D, Zhang W, Li Y, Froguel P, Balding D, Scott J, Kooner JS. Common genetic variation near MC4R is associated with waist circumference and insulin resistance. Nat Genet. 2008;40(6):716-718. doi: 10.1038/ng.156.

Christakis, NA, Fowler JH. The spread of obesity in a large social network over 32 years. N Engl J Med, 2007;357(4):370-379. doi:10.1056/NEJMsa066082.

Cohen-Cole E, Fletcher JM. Is obesity contagious? Social networks vs. environmental factors in the obesity epidemic. J Health Econ. 2008;27(5):1382-1387. doi: 10.1016/j.jhealeco.2008.04.005.

Denham J, Nelson CP, O'Brien BJ, Nankervis SA, Denniff M, Harvey JT, Marques FZ, Codd V, Zukowska-Szczechowska E, Samani NJ, Tomaszewski M, Charchar FJ. Longer leukocyte telomeres are associated with ultra-endurance exercise independent of cardiovascular risk factors. PLoS One. 2013;8(7):e69377. doi: 10.1371/journal.pone.0069377.

Ehrlich GD, Hiller NL, Hu FZ. What makes pathogens pathogenic. Genome Biology, 2008;9:225. doi:10.1186/gb-2008-9-6-225

Eisen J. What does the term microbiome mean? And where did it come from? A bit of a surprise The Winnower 2015; 2:e142971.16196. DOI: 10.15200/winn.142971.16196.

Gilbert SF, McDonald E, Boyle N, Buttino N, Gyi L, Mai M, Prakash N, Robinson J. Symbiosis as a source of selectable epigenetic variation: taking the heat for the big guy. Philos Trans R Soc Lond B Biol Sci. 2010;365(1540):671-678. DOI: 10.1098/rstb.2009.0245.

Godfrey KM, Costello PM, Lillycrop KA. The developmental environment, epigenetic biomarkers and long-term health. J Dev Orig Health Dis. 2015;6(5):399-406. doi: 10.1017/S204017441500121X.

Godfrey KM, Inskip HM, Hanson MA.The long-term effects of prenatal development on growth and metabolism. Semin Reprod Med. 2011;29(3):257-265. doi: 10.1055/s-0031-1275518.

Herrera BM, Keildson S, Lindgren CM. Genetics and epigenetics of obesity. Maturitas. 2011;69(1):41-49. doi: 10.1016/j.maturitas.2011.02.018.

Kahlert C, Müller P. Microbiome - découverte d'un organe. Forum Med Suisse 2014;14(1617):342-344.

Kanherkar RR, Bhatia-Dey Naina, Csoka AB. Epigenetics a cross the human lifespan. Front Cell Dev Biol. 2014;2(49):1-19. https://doi.org/10.3389/fcell.2014.00049

Kashimoto RK, Toffoli LV, Manfredo MH, Volpini VL, Martins-Pinge MC, Pelosi GG, Gomes MV. Physical exercise affects the epigenetic programming of rat brain and modulates the adaptive response evoked by repeated restraint stress. Behav Brain Res. 2016;296:286-289. doi:10.1016/j.bbr.2015.08.038.

Krushkal J, Murphy LE, Palmer FB, Graff JC, Sutter TR, Mozhui K, Hovinga CA, Thomas F, Park V, Tylavsky FA, Adkins RM. Epigenetic analysis of neurocognitive development at 1 year of age in a community-based pregnancy cohort. Behav Genet. 2014 ;44(2):113-125. doi: 10.1007/s10519-014-9641-2.

Laparra JM, Sanz Y. Interactions of gut microbiota with functional food components and nutraceuticals. Pharmacol Res. 2010;61(3):219-225. doi: 10.1016/j.phrs.2009.11.001.

Epub 2009 Nov 13.
Leberder J. The meaning of epigenetics. The Scientist, 2001;15(18):6.
Lindgren CM, Heid IM, Randall JC, Lamina C, Steinthorsdottir V, Qi L et al. Genome-wide association scan metaanalysis identifies three loci influencing adiposity and fat distribution. PLoS Genet 2009;5(6):e1000508.doi:10.1371/journal.pgen.1000508.
Lindholm ME, Marabita F, Gomez-Cabrero D, Rundqvist H, Ekström TJ et al. An integrative analysis reveals coordinated reprogramming of the epigenome and the transcriptome in human skeletal muscle after training. Epigenetics 2015,9:1557-1569.
Morange M. Quelle place pour l'épigénétique? Medecine/Sciences, 2005;21(4):367-369. DOI: 10.7202/010768ar.
Mustață G, Mustață M. The Microbiome - The Secret Weapon of Modern Medicine. Int. J Med Dent, 2014;4(2):123-137.
Nelson VR, Spiezio SH, Nadeau JH. Transgenerational genetic effects of the paternal Y chromosome on daughters' phenotypes. Epigenomics. 2010;2(4):513-521. doi: 10.2217/epi.10.26.
Noble D. Conrad Waddington and the origin of epigenetics. J Exp Biol, 2015;218:816-818. doi: 10.1242/jeb.120071.
Nyhart Lynn K. Civic and Economic Zoology in Nineteenth-Century Germany: The „Living Communities" of Karl Mobius, Isis: Int Rev devot History Sci Cult Infl, 1998;89(4):605-630.
Paoloni-Giacobino A. Epigénétique et transmission. Rev Med Suisse 2014;10(431):1153.
Perez-Schindler J, Philp A. Regulation of skeletal muscle mitochondrial function by nuclear receptors: implications for health and disease. Clin Sci 2015;129(7):589-599. DOI: 10.1042/CS20150246.
Restian A. Epigenetica. Practica medicală 2010;5(4):237-243.
Rivera, CM, Ren B.. Mapping human epigenomes. Cell J, 2013;155(1):39-55. doi: 10.1016/j.cell.2013.09.011.
Rönn T, Volkov P, Davegårdh C, Dayeh T, Hall E, Olsson AH, Nilsson E, Tornberg Å, Dekker Nitert M, Eriksson KF, Jones HA, Groop L, Ling C. A Six Months Exercise Intervention Influences the Genome-wide DNA Methylation Pattern in Human Adipose Tissue. PLoS Genet, 2013;9(6):e1003572. doi:10.1371/journal.pgen.1003572.
Rosenburg E, Koren O, Reshef L, Efrony R, Zilber-Rosenburg I. The role of microorganisms in coral health, disease and evolution. Nature Rev Microbiol 2007;5(5): 355-362.
Rosenburg E, Zilber-Rosenburg I. Symbiosis and Development: The Hologenome Concept. Birth Defects Research (Part C) 2011;93:56-66.
Salminen SJ, Gueimonde M, Isolauri E. Probiotics That Modify Disease Risk. J Nutr. 2005;135(5):1294-1298.
Simopoulos AP. Genetic variation and dietary response: Nutrigenetics/nutrigenomics. Asia Pacific J Clin Nutritr 2002;11(S6):S117-S128. DOI: 10.1046/j.1440-6047.11.s6.3.
Slonczewski JL, Foster JW. Microbiology: An Evolving Science. WW. Norton & Co New York, 2011.
Stecher B, Hardt WD. The role of microbiota in infectious disease. Trends Microbiol. 2008; 16(3):107-114. doi: 10.1016/j.tim.2007.12.008.
Tarry-Adkins JL, Fernandez-Twinn DS, Chen JH et al. Poor maternal nutrition and accelerated postnatal growth induces an accelerated aging phenotype and oxidative stress in skeletal muscle of male rats. Dis Models Mech 2016;9(10):1221-1229. doi:10.1242/dmm.026591
Turnbaugh PJ, Ley RE, Mahowald MA, Magrini V, Mardis ER, Gordon JI. An obesity-associated gut microbiome with increased capacity for energy harvest. Nature 2006;444(7122):1027-1031. doi:10.1038/nature05414.
Tyagi SC, Joshua IG. Exercise and nutrition in myocardial matrix metabolism, remodeling, regeneration, epigenetics, microcirculation, and muscle. Can J Physiol Pharmacol. 2014;92(7):521-523. doi: 10.1139/cjpp-2014-0197.
Ursu RI, Badiu C, Cucu N, Ursu GF, Craciunescu I et al. The study of the rs9939609 FTO gene polymorphism in association with obesity and the management of obesity in a Romanian cohort. J Med Life 2015;8(2):232-238.
Voisin S, Eynon N, Yan X, Bishop DJ. Exercise training and DNA methylation in humans. Acta Physiol (Oxf) 2015;213(1):39-59. doi: 10.1111/apha.12414.
Waddington CH. Canalization of development and the inheritance of acquired characters. Nature 1942b; 150(3811):563-565. DOI: 10.1038/150563a0.
Waddington CH. Science and Ethics. George Allen & Unwin, London, 1942a.
Waddington CH. The epigenotype. 1942c. Int J Epidemiol. 2012;41(1):10-13. doi: 10.1093/ije/dyr184.
Waddington CH. The genetic assimilation of the bithorax phenotype. Evolution 1956;10(1):1-13. doi:10.2307/2406091.
Wardle J, Carnell S, Haworth CM, Plomin R. Evidence for a strong genetic influence on childhood adiposity despite the force of the obesogenic environment. Am J Clin Nutr. 2008;87(2):398-404.
Yamamoto H, Itoh N, Kawano S, Yatsukawa Y, Momose T, Makio T, Matsunaga M, Yokota M, Esaki M, Shodai T, Kohda D, Hobbs AE, Jensen RE, Endo T. Dual role of the receptor Tom20 in specificity and efficiency of protein import into mitochondria. Proc Natl Acad Sci U S A. 2011a;108(1):91-96. doi: 10.1073/pnas.1014918108.
Yamamoto H, Williams EG, Mouchiroud L, Cantó C, Fan W, Downes M, Héligon C, Barish GD, Desvergne B, Evans RM, Schoonjans K, Auwerx J. NCoR1 is a conserved physiological modulator of muscle mass and oxidative function. Cell. 2011b;147(4):827-839. doi: 10.1016/j.cell.2011.10.017.
Zilber-Rosenburg I, Rosenburg E. Role of microorganisms in the evolution of animals and plants: the hologenome theory of evolution. Fed Eur Microbiol Soc. Microbiol Rev. 2008;32(5):723-735. doi: 10.1111/j.1574-6976.2008.00123.x.
Zimmer P, Bloch W. Physical exercise and epigenetic adaptations of the cardiovascular system. Herz. 2015;40(3):353-360. doi: 10.1007/s00059-015-4213-7.

Websites
(1) http://www.metahit.eu/ Accessed on 28 October 2016.

Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 4, October-December 2016, 290–295

Physical activity in oncologic patients

Activitatea fizică la pacienții oncologici

Anne-Marie Constantin [1], Călin Căinap [2], Sergiu David [1], Bianca Boșca [1], Alina Șovrea [1]
[1] *"Iuliu Haţieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania*
[2] *"Prof. Dr. Ion Chiricuţă" Oncology Institute, Cluj-Napoca, Romania*

Abstract

General health benefits from regular exercise programs. Among the beneficial effects, improvements in cardiovascular and respiratory parameters, digestive status, muscular and osteoarticular mass and metabolism, neurological and psychic symptoms; endocrine effects and control of body composition and weight; modifications of the immune system and induction of systemic anti-inflammatory effects can be demonstrated. Also, in oncologic patients, exercise programs reduce toxicities and side effects of treatment and improve physiological parameters, physical function, psychological well-being, treatment outcomes and overall health-related quality of life; can reduce even the risks for some cancers.

Implementing regular exercise programs in cancer patients and survivors faces several challenges regarding patient selection and information, psychological factors, design of exercise programs, establishing outcomes, health professionals' perception and even environmental factors. More research is required before exercise gains widespread acceptance.

Key words: exercise programs, beneficial effects, cancer risk.

Rezumat

Sănătatea în general beneficiază de programele regulate de exerciții fizice. Printre efectele benefice, s-au evidențiat îmbunătățirea parametrilor cardiovasculari și respiratorii, a funcției digestive, a masei musculare și osteoarticulare și a metabolismului, a simptomelor neurologice și psihice; de asemenea, s-au demostrat efecte endocrine și controlul compoziției corporale și a greutății, modificări ale sistemului imunitar și efecte anti-inflamatorii sistemice. La pacienții oncologici, programele de exerciții fizice au numeroase efecte benefice: reduc reacțiile toxice și efectele secundare ale tratamentului și îmbunătățesc parametrii fiziologici, funcția fizică, bunăstarea psihologică, rezultatele tratamentului și calitatea generală a vieții; pot reduce chiar și riscurile pentru anumite tipuri de cancer.

Implementarea unor programe regulate de exerciții fizice la pacienții și supraviețuitorii cancerului se confruntă cu mai multe provocări în ceea ce privește selectarea pacienților și informațiile de care aceştia dispun, factorii psihologici, proiectarea programelor de exerciții, stabilirea rezultatelor, percepția profesioniștilor din domeniul sănătății și chiar și factorii de mediu. Este încă necesară o cercetare continuă înainte de acceptarea pe scară largă a beneficiilor induse de programele de exerciții.

Cuvinte cheie: programe de exerciții fizice, efecte benefice, riscul de cancer.

Introduction

A healthy lifestyle can be characterized by: no smoking (never smoking or no smoking for at least 5 years), no or moderate alcohol drinking, a body mass index (weight/height^2) between 18.5 and 27.5, and regular physical activity (vigorous-intensity aerobic exercise for at least 75 minutes or moderate-intensity exercise for 150 minutes) (Song & Giovannucci, 2016). Physical activity means "any body movement produced by the contraction of skeletal muscles that causes substantial energy expenditure beyond resting values" (***, 2014).

Besides diet, alcohol consumption and smoking, the most accessible lifestyle factor that can be modified is physical activity. In all people, including cancer survivors, correcting the status of these factors leads to improvements of health-related quality of life. Especially for physical activity, several studies have found evidence that supports the positive association between health-related quality of life and physical exercise (Gopalakrishna et al, 2016). Also, modification of diet and occupational factors can significantly reduce the cancer burden (Al-Zalabani et al, 2016).

Received: 2016, November 3; *Accepted for publication:* 2016, December 16;
Address for correspondence: "Iuliu Haţieganu" University of Medicine and Pharmacy, Pasteur str., No. 6-8, CP 540139, Cluj-Napoca, Romania
E-mail: annemarie_chindris@yahoo.com
Corresponding author: Anne-Marie Constantin, annemarie_chindris@yahoo.com

Health benefits of regular physical exercise

General health benefits from exercise programs such as aerobic, resistance, flexibility, and balance training. Aerobic training, including walking, jogging, cycling, running or swimming, involves large muscle groups, which act in a dynamic and rhythmic manner, for sustained periods of time (Garber et al., 2011).

Exercise as a regular physical activity is the only one that can be efficient against a large spectrum of chronic diseases. The continuous increase of the elderly population also increases the prevalence of the main chronic diseases, including cancer (and also metabolic diseases such as obesity and type 2 diabetes, arterial diseases - hypertension and atherosclerosis, chronic pulmonary, neurodegenerative, kidney and immune-mediated diseases) (Di Raimondo et al., 2016).

The wide range of immediate and long-term health benefits of regular physical exercise is well known, both for young and older adults. Through regular exercise, a lot of physiological, biochemical and even transcriptional changes occur, which improve both mental and physical health (Lindholm et al., 2016). The adaptation of the human body induced by exercise engages signaling mechanisms, specific DNA replication and finally generates new proteins (Coffey & Hawley, 2007). Individual people vary in their responses and the physiological effects of exercise-induced adaptations are determined by the frequency and intensity of physical activity.

The myriad beneficial effects of a regular exercise program include the following:

- cardiovascular parameters improvements - reduced incidence of several diseases such as coronary arterial disease, stroke, hypertension; - through improvements in cardiac power and heart contractility, heart rate variability parameters returned to their baseline values (Hsu et al., 2016); and also, through reductions of blood pressure and reactive hyperemia (Santos et al., 2016), improvement of endothelial function (nitric oxide availability) (Antunes et al., 2016);

- respiratory parameters - exercise training was proved to prevent and contribute to rehabilitation of chronic diseases (Vainshelboim, 2016) through improvements in peak VO_2 values, breathing pattern, dyspnea;

- digestive effects - the gut microbiota strongly interacts with the immune system, can influence health and disease, and it can be modified by physical exercise (Cerdá et al., 2016). This great immunological responsibility of gut microbiota offers therefore to exercise a beneficial role in preventing and ameliorating gut inflammatory diseases (for example, ulcerative colitis) (Cook et al., 2016);

- muscular and osteoarticular characteristics - improvement of bone density, flexibility, muscular strength and endurance, and reduction of risk for falls and injury; the effects of exercise are translated into molecular pathways of all bone cells which will remodel the bone (Castrogiovanni et al., 2016);

- neurological and mental benefits - regular exercise optimizes the sympathetic nervous system as the stress responsive system, reduces emotional and physiological reactivity, and enhances neuroplasticity and growth factor expression (Silverman & Deuster, 2014); also, it increases positive mood and well-being, therefore inducing benefits for cognition and social functioning; it also reduces depression and anxiety (Salmon, 2001);

- endocrine effects - exercise activates the hypothalamic-pituitary-adrenal axis, releases vasopressin (for saving water) and growth hormone (which induces activity of the growth hormone-insulin-like growth factor-1 axis and increases the effects of sex steroid hormones on the structure and function of skeletal muscles) (Jansen, 2016). Exercise also stimulates the release of thyroxin and testosterone, reduces blood insulin concentrations and increases insulin sensitivity, releases epinephrine (which also enhances the ability to use muscles), releases endorphins (which diminish pain sensitivity and can reduce tension or anxiety by inducing a sense of euphoria). Also, exercise improves thymus function, with immunological and fatigue-delaying effects (Kraemer & Rogol, 2005);

- control of body composition and weight - properly selected regular exercise improves total daily energy expenditure (Leońska-Duniec et al., 2016). Adequate aerobic exercise in particular was proved to exert metabolic benefits (Keating et al., 2016);

- the immune system - it works together with the nervous and endocrine systems and it shares the same ability to adapt to physical exercise (especially B lymphocytes) (Fragala et al., 2011). A single intense exercise session (peak aerobic exercise), more than submaximal exercise, more rapidly induces a higher increase of neutrophils, monocytes and lymphocytes (Szlezak et al., 2016) and a decrease in the CD4+/CD8+ ratio (Natale et al., 2003). Regular exercise at a moderate intensity can reduce the incidence of infections (Gleeson, 2007);

- induction of systemic anti-inflammatory effects - longer duration exercise is more efficient in creating an anti-inflammatory state - through increases in interleukins 10 and 6 (Cullen et al., 2016). Also, regular exercise reduces the mass of visceral fat and subsequently decreases the release of adipokines (Gleeson et al., 2011), diminishes TNF-α and upregulates the mitochondrial antioxidant system (Antunes et al., 2016). Therefore, regular exercise has steady anti-inflammatory effects that can protect against chronic diseases, which are regularly associated with systemic inflammation.

Effects of regular exercise in oncologic patients

The lack of regular physical exercise and a sedentary lifestyle increase mortality by all causes, including cancer. For example, a study involving physically inactive middle-aged women (less than 1 hour of exercise per week) showed a 52% increased mortality by all causes, a doubled cardiovascular mortality and a 29% increase in cancer-related mortality, compared with physically active women (Hu et al., 2004).

The majority of cancer survivors have low levels of physical activity and do not participate in recommended exercise programs, which increases the disease risks and health care costs (Irwin, 2009). The factors that can limit the participation of oncologic patients in physical activity programs and therefore diminish cancer outcomes are correlated, in addition to toxicity to therapy, with:

comorbidities, a poor baseline health status, functional limitations, cognitive decline, and limited social support (Mohile et al., 2012). Besides, in older adults, cancer diagnosis and its treatments accelerate the physical and emotional decline (Kilari et al., 2016).

Among cancer survivors, the most frequent are obesity and a sedentary lifestyle. An increased number of studies have shown that low levels of physical activity and obesity are statistically significantly associated with cancer recurrence and death (Irwin, 2009). Also, obesity and type 2 diabetes mellitus are common and significant conditions among adult survivors of childhood cancer (Barnea et al., 2015).

Exercise activities designed to optimize balance, flexibility, and strength have multiple positive effects on numerous domains that can be used as indicators in order to assess the positive outcomes: physiological parameters - improvements including immune function, cardiovascular endurance, strength, balance, body composition, lean mass and bone mass (Fairman et al., 2016; Irwin et al., 2009); physical function - through performance indicators, self-reported functioning and symptoms; psychological well-being - it can ameliorate fatigue, insomnia, anxiety, cognitive decline, and increase independence and overall health-related quality of life (Brown et al., 2011; Irwin et al., 2009; Tang et al., 2010; Kilari et al., 2016). In addition to all those mentioned above, regular physical activity was shown to reduce toxicities and side effects of treatment and to exert positive effects on treatment outcomes (Kilari et al., 2016).

Most studies (randomized control trials) have proved the beneficial effects of routine physical activity in breast and prostate cancers. The improvements shown were the following: increase in functional status and physical activity and significant increase of the diet quality index (in breast and prostate cancer) (Demark-Wahnefried et al., 2006); significant increase in physical function (measured on the Short Form-36 subscale), physical activity, quality of life, and significant decrease of the body mass index (in breast, prostate and colorectal cancer) (Morey et al., 2009); preservation of lean mass, diminution of fatigue and psychological distress, increase of lower body function and significant increase of muscular strength and social functioning (in prostate cancer) (Cormie et al., 2015); reduction of disability, increase of objective and self-reported physical function, and significant increase of bench press and leg strength (in prostate cancer) (Winters-Stone et al., 2015); decrease of cancer related fatigue and global side effect burden (in breast and other cancers) (Sprod et al., 2015).

However, a stronger prescription of physical activity in order to be routinely implemented in all cancer subtypes is still necessary; therefore, more studies are required to convince patients and clinicians about the positive effects of a routine exercise and to gain widespread acceptance. Exercise should be adapted to the needs of cancer survivors and focused on the need to improve the targeted outcome. Research for an adaptive exercise program must focus on current knowledge gaps and investigate more accurately whether tumor, clinical, or risk factor characteristics are significantly associated with the effects of physical activity. An adequate study, with cancer-specific biomarkers and disease endpoints, such as recurrence, can convince and can lead to integration of exercise regimens into anticancer therapy (Kilari et al., 2016).

Regular exercise in cancer prevention

In chronic disease of the non-cancer population, regular exercise has shown well-proven benefits in both primary and secondary prevention. However, there are also epidemiological studies showing that increased physical activity via regular exercise reduces the overall risk of cancer recurrence and cancer mortality; significant associations were mainly evidenced for breast and colon cancer specific mortality (Ballard-Barbash et al., 2012; Betof et al., 2013). Also, some studies demonstrated that regular physical activity fights the negative effects of sedentary jobs and can reduce the risks of prostate cancer (Noonan & Farrell, 2016) or bladder cancer (Song & Giovannucci, 2016).

The prevention of post-surgery complications requires exercise-based rehabilitation techniques. Complications such as upper limb lymphedema, mobility impairment and reduced muscle strength and function, defective posture alignment, fatigue and low physical endurance, lung complications, psychosocial difficulties, all require rehabilitation techniques (Irsay et al., 2014). For example, a routine exercise program is very important in recovery after breast surgery and in preventing or treating lymphedema (Puşcaş & Tache, 2015). Similarly to other therapy options (surgery, chemotherapy, radiotherapy, hormone therapy, targeted therapy, etc.), medical rehabilitation plays an important role in establishing the patient's body function and quality of life (Irsay et al., 2014).

Designing exercise programs for cancer patients

Regular exercise programs have shown efficacy in ameliorating both the physical and psychological impairments induced by cancer and its treatment. Rehabilitation programs reduce fatigue, pain or dyspnea, increase physical functionality and improve the quality of life. Major benefits of kinesiotherapy have been demonstrated by several recent studies; this is an argument for the need to initiate rehabilitation exercise programs as soon after surgery as possible (Irsay et al., 2014).

The implementation of a regular program and the recruitment of cancer patients in clinical trials that are able to prove the efficacy of those programs encounter several barriers at different levels:

- patient selection and information - patients with low baseline functional status are excluded; breast and prostate cancer survivors are predominantly recruited; the chosen population is racially and ethnically homogeneous; some programs only accept patients who have completed all forms of treatment; selection is not based on individual physical activity needs; the individual risk level of exercise and contraindications for the exact type of physical activity are not assessed; limited information of patients regarding the active treatment of cancer and about where they should go to obtain this information from a professional; limited adherence of patients to clinical studies (Kilari et al., 2016);
- psychological factors - interest in exercise, beliefs

about the importance of exercise and lack of information about the potential benefit of exercise interventions and the available resources for exercise programs;

- design of the exercise program – it is not adapted to the type and stage of cancer or treatment; it is not integrated into cancer care; it tends to be short (usually 4–12 weeks); exercise sessions are in a group format and are not personalized to patient status, needs or patient lifestyle (in terms of frequency, duration, intensity or mode); it does not provide feedback after the completion of the study; adverse events are often not considered or known; quality of life concerns are not routinely addressed throughout the course of the exercise program (Kilari et al., 2016);

- establishing outcomes - the impact of the exercise intervention on cancer outcomes is not regularly assessed; the outcomes centered on the patient are not prioritized; some functional outcomes are not routinely measured; the long-term effects of exercise programs on outcomes are unknown (Kilari et al., 2016);

- health professionals' perception - clinician fears of toxicity, limited information about the role of exercise in improving physical status and activity; an exercise physiologist or a physiotherapist can sustain physical activity participation through research evidence;

- environmental factors - occupational status, lack of time and bad weather (Chou et al., 2016).

Some measures that can help to overcome the above mentioned barriers could be:

- for patient selection - education about the role of exercise in improving physical fitness and cancer prognosis; involvement of the patient and community from the beginning; the programs should be designed and tested along the whole cancer continuum (diagnosis, active treatment, post-treatment);

- for the design of the exercise program - must be based on individual physical activity needs (cancer type, therapy, physical limitations and comorbidities); must be adapted to the targeted outcome; needs to provide feedback and to be increased gradually, based on participant tolerance; needs to be designed with the community in mind (e.g., considering transportation, parking, time of day, etc.);

- for health professionals' involvement - all health professionals must ally and integrate into clinical trials (particularly physiotherapists or exercise physiologists);

- for establishing outcomes - needs a better understanding of the complexity of older patients with cancer; needs to be relevant to patients (functional and quality of life outcomes are more relevant than maximal aerobic capacity); in order to ensure relevance and feasibility of outcomes of interest, feedback and involvement from all health professionals are required.

Regarding the duration and type of exercises, the American College of Sports Medicine (ACSM) published public health recommendations for exercise among cancer patients and survivors. A supervised and personalized program (a combination of muscular strength/endurance and cardiovascular endurance exercises) is safe, has no risks and has a greater potential of improving physical functions than a general program (Anderson et al., 2012). An exercise program significantly influencing ACSM recommends that "patients and survivors exercise at least 150 minutes per week of aerobic activity on most days of the week at a moderate intensity level or 30 minutes of vigorous aerobic activity 3 days of the week, accompanied by at least 20-30 minutes of resistance activity 2 or more days per week" (1; Rock et al., 2012; Chou et al., 2016). It is recommended to cancer patients and survivors to start low, progress slowly and get help from qualified professionals. Despite these published public health guidelines, it is estimated that up to 70% of cancer survivors do not meet these ACSM public health recommendations (Irwin, 2009). The two main reasons for this are 1) a lack of awareness among health care providers, patients, and survivors of these exercise recommendations, and 2) a lack of understanding about how to provide precise exercise prescriptions for individuals to effectively treat specific cancer and treatment-related outcomes.

An example of exercise program at a community center could be (Desveaux et al., 2016): 1) warming up (10 minutes, with gentle stretches for all major muscle groups - neck, shoulders, arms, hamstrings, quadriceps, and calves; marching on the spot to increase heart rate); 2) aerobic training (20-30 minutes, walking along a designated track with rests as needed, cycling and/or treadmill); 3) functional exercises to promote strength and balance (20-30 minutes - free weights and 'wall climbing' for upper extremity; mini-squats, stairs, hip abduction and hip extension while holding onto the back of a chair with bands available to add resistance for lower extremity; basic balance exercises such as practicing tandem stance, standing on one leg, walking on different surfaces (with mats and rails available for safety); 4) cool down (10 minutes, with gentle stretches for all major muscle groups - neck, shoulders, arms, hams, quads, and calves; slow walking to decrease heart rate). Each exercise targets specific muscle groups and exercises are commonly performed using groups of 2-4 sets (Chodzko-Zajko et al., 2009; 1). For conferring confidence to patients, the program's proximity and health care professional support should always be kept in mind.

Researchers have also utilized aqua aerobics with cancer survivors (in breast cancer); this reduces axial loading and allows participants to perform exercises they may not be able to do on land (Cantarero-Villanueva et al., 2013; Fernandez-Lao et al., 2013).

The final aims of all those measures are to decrease hospitalization, reduce cancer treatment toxicity, increase the disease-free period and overall survival and even contribute to cancer prevention.

Overall, promoting an active life improves quality of life and in order to achieve this goal, all segments of society should collaborate with one another.

Conclusions

1. Commonly, after development of a cancer, physical activity is reduced.

2. A greater physical activity level decreases the risks of cancer and increases the quality of life, before and after surgery.

3. Regular physical activity as a lifestyle modification can represent a primary prevention measure for cancer control, and alleviates the important burden of cancer for the health system.

4. Implementing exercise programs for cancer patients and survivors requires measures regarding patient education, program adaptation based on individual activity needs, establishing relevant outcomes, health professionals' involvement.

5. Further research is required before exercise gains widespread acceptance.

Conflicts of interest

There are no conflicts of interests.

References

Al-Zalabani AH, Stewart KF, Wesselius A, Schols AM, Zeegers MP. Modifiable risk factors for the prevention of bladder cancer: a systematic review of meta-analyses. Eur J Epidemiol. 2016; 31(9):811-851. doi: 10.1007/s10654-016-0138-6.

Anderson RT, Kimmick GG, McCoy TP, Hopkins J, Levine E, Miller G, Ribisl P, Mihalko SL. A randomized trial of exercise on well-being and function following breast cancer surgery: the RESTORE trial. J Cancer Surviv. 2012; 6(2):172-181. doi: 10.1007/s11764-011-0208-4.

Antunes BM, Rossi FE, Cholewa JM, Lira FS. Regular Physical Activity and Vascular Aging. Curr Pharm Des. 2016; 22(24):3715-3729.

Ballard-Barbash R, Friedenreich CM, Courneya KS, Siddiqi SM, McTiernan A, Alfano CM. Physical activity, biomarkers, and disease outcomes in cancer survivors: a systematic review. J Natl Cancer Inst. 2012;104(11):815-840.

Barnea D, Raghunathan N, Friedman DN, Tonorezos ES. Obesity and Metabolic Disease After Childhood Cancer. Oncology (Williston Park). 2015;29(11):849-855.

Betof AS, Dewhirst MW, Jones LW. Effects and potential mechanisms of exercise training on cancer progression: a translational perspective. Brain Behav Immun. 2013;30(0):S75-S87.

Brown JC, Huedo-Medina TB, Pescatello LS, Pescatello SM, Ferrer RA, Johnson BT. Efficacy of exercise interventions in modulating cancer-related fatigue among adult cancer survivors: a meta-analysis. Cancer Epidemiol Biomarkers Prev. 2011;20(1):123-133.

Cantarero-Villanueva I, Fernández-Lao C, Cuesta-Vargas AI, Del Moral-Avila R, Fernandez-de-las-Penas C, Arroyo-Morales M. The effectiveness of a deep water aquatic exercise program in cancer-related fatigue in breast cancer survivors: a randomized controlled trial. Arch Phys Med Rehab. 2013;94(2):221-230.

Castrogiovanni P, Trovato FM, Szychlinska MA, Nsir H, Imbesi R, Musumeci G. The importance of physical activity in osteoporosis. From the molecular pathways to the clinical evidence. Histol Histopathol. 2016; 31(11):1183-94. doi: 10.14670/HH-11-793.

Cerdá B, Pérez M, Pérez-Santiago JD, Tornero-Aguilera JF, González-Soltero R, Larrosa M. Gut Microbiota Modification: Another Piece in the Puzzle of the Benefits of Physical Exercise in Health? Front Physiol. 2016;7:51. doi: 10.3389/fphys.2016.00051.

Chodzko-Zajko WJ, Proctor DN, Fiatarone Singh MA, Minson CT, Nigg CR, Salem GJ, Skinner JS. American College of Sports Medicine position stand. Exercise and physical activity for older adults. Med Sci Sports Exerc. 2009;41(7):1510-1530.

Chou YJ, Lai YH, Lin BR, Liang JT, Shun SC. Factors Influencing Amount of Weekly Exercise Time in Colorectal Cancer Survivors. Cancer Nurs. 2016 Apr 29. [Epub ahead of print].

Coffey VG, Hawley JA. The molecular bases of training adaptation. Sports Med. 2007;37(9):737-763.

Cook MD, Allen JM, Pence BD, Wallig MA, Gaskins HR, White BA, Woods JA. Exercise and gut immune function: evidence of alterations in colon immune cell homeostasis and microbiome characteristics with exercise training. Immunol Cell Biol. 2016;94(2):158-163. doi: 10.1038/icb.2015.108.

Cormie P, Galvao DA, Spry N, Joseph D, Chee R, Taaffe DR, Chambers SK, Newton RU. Can supervised exercise prevent treatment toxicity in patients with prostate cancer initiating androgen-deprivation therapy: a randomised controlled trial. BJU Int. 2015;115(2):256-266.

Cullen T, Thomas AW, Webb R, Hughes MG. Interleukin-6 and associated cytokine responses to an acute bout of high-intensity interval exercise: the effect of exercise intensity and volume. Appl Physiol Nutr Metab. 2016;41(8):803-808. doi: 10.1139/apnm-2015-0640.

Demark-Wahnefried W, Clipp EC, Morey MC, Pieper CF, Sloane R, Snyder DC, Cohen HJ. Lifestyle intervention development study to improve physical function in older adults with cancer: outcomes from project LEAD. J Clin Oncol. 2006;24(21):3465-3473.

Desveaux L, Beauchamp MK, Lee A, Ivers N, Goldstein R, Brooks D. Effects of a Community-Based, Post-Rehabilitation Exercise Program in COPD: Protocol for a Randomized Controlled Trial With Embedded Process Evaluation. JMIR Res Protoc. 2016;5(2):e63. doi: 10.2196/resprot.5435.

Di Raimondo D, Musiari G, Miceli G, Arnao V, Pinto A. Preventive and Therapeutic Role of Muscle Contraction Against Chronic Diseases. Curr Pharm Des. 2016;22(30):4686-4699.

Fairman CM, Kendall KL, Harris BS, Crandall KJ, McMillan J. Utilization of an Anti-Gravity Treadmill in a Physical Activity Program with Female Breast Cancer Survivors: A Pilot Study. Int J Exerc Sci. 2016;9(1):101-109.

Fernandez-Lao C, Cantarero-Villanueva I, Ariza-Garcia A, Courtney C, Fernandez-de-las-Penas C, Arroyo-Morales M. Water versus land-based multimodal exercise program effects on body composition in breast cancer survivors: a controlled clinical trial. Support Care Cancer. 2013; 21(2):521-530.

Fragala MS, Kraemer WJ, Denegar CR, Maresh CM, Mastro AM, Volek JS. Neuroendocrine-immune interactions and responses to exercise. Sports Med. 2011;41:621-639.

Garber CE, Blissmer B, Deschenes MR, Franklin BA, Lamonte MJ, Lee IM, Nieman DC, Swain DP; American College of Sports Medicine. American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. Med Sci Sports Exerc. 2011;43(7):1334-1359.

Gleeson M. Immune function in sport and exercise. J Appl Physiol, 2007;103:693-699.

Gleeson M, Bishop NC, Stensel DJ, Lindley MR, Mastana SS, Nimmo MA. The anti-inflammatory effects of exercise: mechanisms and implications for the prevention and treatment of disease. Nat Rev Immunol. 2011;11(9):607-615.

Gopalakrishna A, Longo TA, Fantony JJ, Van Noord M, Inman BA. Lifestyle factors and health-related quality of life in bladder cancer survivors: a systematic review. J Cancer Surviv. 2016;10(5):874-882. doi: 10.1007/s11764-016-0533-8.

Hsu CC, Liang CS, Tai YM, Cheng SL. Incongruent changes in heart rate variability and body weight after discontinuing aerobic exercise in patients with schizophrenia. Int J Psychophysiol. 2016; 109:132-137. doi: 10.1016/j.ijpsycho.2016.08.011.

Hu FB, Willett WC, Li T, Stampfer MJ, Colditz GA, Manson JE. Adiposity as compared with physical activity in predicting

mortality among women. N Engl J Med, 2004;351(26):2694-2703.

Irsay L, Bordînc E, Borda M, Ciortea V, Ungur R, Onac I. Principles of postoperative breast cancer rehabilitation. Palestrica of the Third Millennium, 2014;15(2):140-145.

Irwin ML. Physical activity interventions for cancer survivors. Br J Sports Med. 2009;43(1):32-38.

Irwin ML, Alvarez-Reeves M, Cadmus L, Mierzejewski E, Mayne ST, Yu H, Chung GG, Jones B, Knobf MT, DiPietro L. Exercise improves body fat, lean mass, and bone mass in breast cancer survivors. Obesity 2009;17(8):1534-1541.

Janssen JA. Impact of Physical Exercise on Endocrine Aging. Front Horm Res. 2016;47:68-81. doi: 10.1159/000445158.

Keating SE, Hackett DA, Parker HM, Way KL, O'Connor HT, Sainsbury A, Baker MK, Chuter VH, Caterson ID, George J, Johnson NA. Effect of resistance training on liver fat and visceral adiposity in adults with obesity: A randomized controlled trial. Hepatol Res. 2016 Aug 1. doi: 10.1111/hepr.12781. [Epub ahead of print]

Kilari D, Soto-Perez-de-Celis E, Mohile SG, Alibhai SM, Presley CJ, Wildes TM, Klepin HD, Demark-Wahnefried W, Jatoi A, Harrison R, Won E, Mustian KM. Designing exercise clinical trials for older adults with cancer: Recommendations from 2015 Cancer and Aging Research Group NCI U13 Meeting. J Geriatr Oncol. 2016;7(4):293-304. doi: 10.1016/j.jgo.2016.04.007.

Kraemer WJ, Rogol AD. The Endocrine System in Sports and Exercise. Blackwell Publishing, Oxford, 2005

Leońska-Duniec A, Ahmetov II, Zmijewski P. Genetic variants influencing effectiveness of exercise training programmes in obesity - an overview of human studies. Biol Sport. 2016;33(3):207-214. doi: 10.5604/20831862.1201052.

Lindholm ME, Giacomello S, Werne Solnestam B, Fischer H, Huss M, Kjellqvist S, Sundberg CJ. The Impact of Endurance Training on Human Skeletal Muscle Memory, Global Isoform Expression and Novel Transcripts. PLoS Genet. 2016;12(9):e1006294. doi: 10.1371/journal.pgen.1006294.

Mohile S, Dale W, Hurria A. Geriatric oncology research to improve clinical care. Nat Rev Clin Oncol. 2012;9(10):571-578.

Morey MC, Snyder DC, Sloane R, Cohen HJ, Peterson B, Hartman TJ, Miller P, Mitchell DC, Demark-Wahnefried W. Effects of home-based diet and exercise on functional outcomes among older, overweight long-term cancer survivors: RENEW: a randomized controlled trial. JAMA 2009;301(18):1883-1891.

Natale VM, Brenner IK, Moldoveanu AI, Vasiliou P, Shek P, Shephard RJ. Effects of three different types of exercise on blood leukocyte count during and following exercise. Sao Paulo Med J. 2003;121(1):9-14.

Noonan EM, Farrell TW. Primary Care of the Prostate Cancer Survivor. Am Fam Physician, 2016;93(9):764-770.

Puşcaş DM, Tache S. The importance of an exercise program in breast cancer related lymphedema. Palestrica of the Third Millennium, 2015;16(2):172-175.

Rock CL, Doyle C, Demark-Wahnefried W, Meyerhardt J, Courneya KS, Schwartz AL, Bandera EV, Hamilton KK, Grant B, McCullough M, Byers T, Gansler T. Nutrition and physical activity guidelines for cancer survivors. CA Cancer J Clin. 2012;62(4):242-274.

Salmon P. Effects of physical exercise on anxiety, depression, and sensitivity to stress: a unifying theory. Clin Psychol Rev. 2001;21(1):33-61.

Santos LP, Moraes RS, Vieira PJ, Ash GI, Waclawovsky G, Pescatello LS, Umpierre D. Effects of aerobic exercise intensity on ambulatory blood pressure and vascular responses in resistant hypertension: a crossover trial. J Hypertens. 2016;34(7):1317-1324.

Silverman MN, Deuster PA. Biological mechanisms underlying the role of physical fitness in health and resilience. Interface Focus. 2014;4(5):20140040. doi: 10.1098/rsfs.2014.0040.

Song M, Giovannucci E. Preventable Incidence and Mortality of Carcinoma Associated With Lifestyle Factors Among White Adults in the United States. JAMA Oncol. 2016;2(9):1154-1161. doi: 10.1001/jamaoncol.2016.0843.

Sprod LK, Fernandez ID, Janelsins MC, Peppone LJ, Atkins JN, Giguere J, Block R, Mustian KM. Effects of yoga on cancer-related fatigue and global side-effect burden in older cancer survivors. J Geriatr Oncol. 2015;6(1):8-14.

Szlezak AM, Szlezak SL, Keane J, Tajouri L, Minahan C. Establishing a dose-response relationship between acute resistance-exercise and the immune system: Protocol for a systematic review. Immunol Lett. 2016;180:54-65. doi: 10.1016/j.imlet.2016.10.010.

Tang MF, Liou TH, Lin CC. Improving sleep quality for cancer patients: benefits of a home-based exercise intervention. Support Care Cancer. 2010;18(10):1329-1339.

Vainshelboim B. Exercise training in idiopathic pulmonary fibrosis: is it of benefit? Breathe (Sheff). 2016;12(2):130-138. doi: 10.1183/20734735.006916.

Winters-Stone KM, Dobek JC, Bennett JA, Dieckmann NF, Maddalozzo GF, Ryan CW, Beer TM. Resistance training reduces disability in prostate cancer survivors on androgen deprivation therapy: evidence from a randomized controlled trial. Arch Phys Med Rehabil. 2015;96(1):7-14.

***, American College of Sports Medicine. ACSM's guidelines for exercise testing and prescription. 9th edn Philadelphia, Wolters Kluwer/Lippincott Williams & Wilkins Health, 2014.

Websites

(1) American College of Sports Medicine. New Guidelines Strongly Recommend Exercise for Cancer Patients, Survivors. Available at: http://www.acsm.org/about-acsm/media-room/acsm-in-the-news/2011/08/01/new-guidelines-strongly-recommend-exercise-for-cancer-patients-survivors. Accessed: October 2016

Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 4, October-December 2016, 296–299

A Romanian book, unjustly forgotten, regarding physical education for children

O carte românească, pe nedrept uitată, despre educaţia fizică a copiilor

Dan Cristian Bârsu
"Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca, Romania, Abilities, Social Sciences Department

Abstract

Physical education developed significantly in Romania during the interwar period, a consequence of the progressive alignment of Romania with Western physical education conceptions. Although physical education was indicated then mainly for adults, it was also being implemented for children. Many of the studies and books written on this subject were unjustly forgotten in the communist decades, one of them being the book "Physical education of children", written by General Alexandru Manolescu and published in 1927. This book was removed from libraries after 1948, because its author became politically undesirable. The aim of our paper is to bring this book to the attention of readers, highlighting its merits. We present the most important data and several programs in this book.

Key words: physical education of children, forgotten book, Alexandru Manolescu.

Rezumat

În România, educaţia fizică a avut în perioada interbelică o dezvoltare semnificativă. Aceasta a fost o consecinţă a alinierii României la concepţiile progresiste din Occident. Deşi educaţia fizică era atunci indicată mai ales adulţilor, totuşi au fost făcute progrese şi în implementarea acesteia la copii. O parte a studiilor şi cărţilor scrise pe această temă au fost uitate pe nedrept în deceniile comuniste. Din această categorie face parte cartea „Educaţia fizică a copiilor", elaborată de lct. general Alexandru Manolescu, publicată în 1927. Volumul a fost scos din biblioteci după 1948, din cauză că autorul a devenit indezirabil politic. Scopul lucrării este de a aduce în atenţia cititorilor această carte, subliniind meritele sale. Prezentăm cele mai importante date şi câteva scheme din această carte.

Cuvinte cheie: educaţia fizică a copiilor, carte uitată, Alexandru Manolescu.

Motto:

"Physical education is not just about character and willpower, it is especially a higher school for health. Physical exercise is an excellent public hygiene method, which is why doctors should know its hygienic effects. Sports represent a positive hygiene, vigorous health and collective education method"

Iuliu Haţieganu, 1937

Introduction

Physical education and sport underwent an interesting development in Romania in the late 19th and early 20th centuries. Here, we will not give a picture of this evolution, but will present some landmarks of the interwar period.

The development of sport in pre-World War I Romania continued after 1918. Without detailing, we emphasize the fact that new sports emerged during this period: basketball, volleyball, rock climbing, table tennis, boxing, rowing, handball. In 1922, the first professional forms of boxing and football were established (1).

The interwar period witnessed the first attempts to crystallize a unitary conception of physical education.

Of great importance was the creation of the National Institute of Physical Education in Bucharest, in 1922. Outstanding professors such as Constantin Kirițescu (1876-1965), Constantin Petre-Lazăr (1896-?), Virgil Bădulescu (1882-?) and Virgil Roşeală contributed to laying the foundations for the status of the physical education discipline, to its scientific foundations and – very importantly – to the improvement of its organization (2). As Kirițescu showed, the reform initiated in 1925 in primary education and in 1928 in secondary education established the role of physical education as part of the Romanian education system. "From the rank of a mere

Received: 2016, October 10; *Accepted for publication:* 2016, October 25;
Address for correspondence: "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca, Abilities – Social Sciences Department, Avram Iancu Street No. 31, Cluj-Napoca, 400083
E-mail: cristianbarsu@yahoo.com
Corresponding author: Dan Cristian Bârsu, cristianbarsu@yahoo.com

neglected skill, physical education (not mere gymnastics) becomes a particularly important discipline for the training of future citizens" (Kirițescu, 1930).

It is noteworthy that in the second interwar decade, methodical medical check-up became compulsory in all institutions and associations where physical exercise was practiced. This measure was taken with the support of the Medical Society of Physical Education in Bucharest, founded in 1932 (Bârsu, 2014).

Physical education knowledge was disseminated by means of lectures, conferences, publication of articles and books, etc.

It is difficult to establish the precise number of specialized studies and books published in the interwar period, because part of these were destroyed during World War II or were confiscated (or destroyed) in the communist period. The cause of this situation was not the content of these books, but rather the wish of communist authorities to remove from libraries the volumes of authors that had become politically undesirable. Such a book is "Physical education of children" by Alexandru Manolescu.

The copy that was available to us was partially deteriorated by moisture and mold from being kept for decades in the store of the Discipline of the History of Medicine in Cluj-Napoca. Even under these circumstances, the fact that it was not removed from the Department's collections – because of the author's *politically undesired* status – is to be appreciated. The person thanks to whom this book was preserved is probably Prof. Dr. Valeriu Bologa (1892-1971), who ran the Department from 1930 to 1962. This copy had initially belonged to the Medical Students Society's Library in Cluj (as can be seen from the label on the book cover) (Fig. 1).

Fig. 1 – The cover of the book "Physical education of children" by Al. Manolescu

General data about the book

The book has a main title: "Physical education of children" and a more extensive subtitle: "Notions of pedagogy and organization for raising children. Age 1-15 years". The title and subtitle suggest the wide range of interests embraced by the author in this volume. The book was published by the "Sunrise Graphic Art Institute" Publishing House in Bucharest, in 1927.

Al. Manolescu noted this dedication: "I dedicate this book to Romanian teachers, as a sign of admiration for their past and future work for children's good education in united Romania".

In the *Foreword* to the book, the author explained why he had started writing it. Thus, he mentioned that "this book can give way to a number of comments, of which the first would be that instead of writing about military tactics or history or even about soldiers' education, an active military man deals with children's education, an occupation reserved for anyone else but a soldier". The author reminded that since his youth, as early as 1912, he had been interested in children's physical education. At that time he had started his career as a teacher at the Dealu Monastery High School. We mention the fact that in 1902, a military orphan school was organized in the former monastery. Then, from 1912 to 1940, the "Nicolae Filipescu" Military High School was based here (3).

Further in the introduction, the author showed that he wished to avoid the education errors he had seen during his school years.

The first chapter of the book refers to general principles for the normal somatic development of children. This comprises notions related to general health, child's somatic development, the relationship between physical, mental and intellectual development, including notions of anatomy and physiology (Fig. 2).

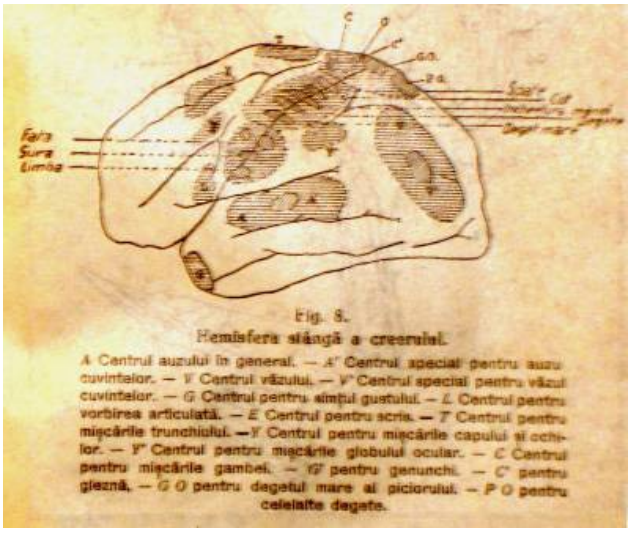


Fig. 2 – The scheme of the left hemisphere of the brain

The author noted some data regarding the educational role of doctors, parents and, particularly, educators. In addition, Manolescu gave a detailed description of the physical examination of children. For this purpose, he included 15 diagrams and tables pertaining to the correlation of weight and height, cranial measurements, etc.

The medical part of this chapter is inspired – according to the author himself – from the works "Le corps et l'âme de l'enfant" by Dr. Fleury and "Les maladies de caractère" by Dr. Flessinger. As a particularity, we mention that in this

chapter, psychological changes such as anger, laziness and mythomania are explained.

The second chapter presents physical exercises depending on different childhood periods, the majority having motor applications, e.g., running, jumping, swinging, etc.

Various riddle games or imitation games are described, which include more extensive physical movements: boys imitate soldiers, firemen, etc., while girls mimic movements with dolls. For older ages, ball games or athletics are described.

The author tries to establish a parallel between the physiological action of these games or exercises and their role on children's physical, mental and intellectual activities.

The third chapter provides data related to hygiene: maintaining physical hygiene in general and hygiene after physical exercise in particular. Data regarding body hygiene, clothing hygiene, indications concerning fatigue manifestations and rest periods, food hygiene, nutritional requirements of children are presented. Also, examples of nutritious foods compared to less nutritious ones are given.

Chapter four describes the general principles for organizing physical education, including intellectual and material preparation. This chapter focuses on the necessary facilities for kindergartens and primary schools, as well as on the organization of play and sports fields.

Chapter five refers to the pedagogy of physical exercise, the so-called physical education training. In addition to different teaching methods and programs, physical movements are explained. Potential errors during these movements are not omitted and their correction is also evidenced. A rare aspect present in such physical education books refers to the handling and maintenance of sports apparatuses. The commands, orders and signals used during the execution of physical exercises are illustrated. This chapter includes a great number of tables with physical exercise plans (Figs. 3 and 4), required for the development of physical programs targeted for different school grades.

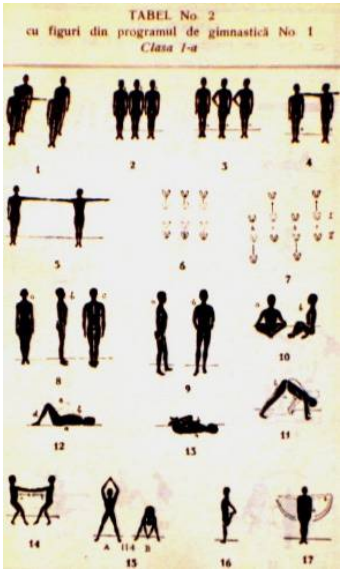


Fig. 3 – Gymnastic exercises for grade 1.

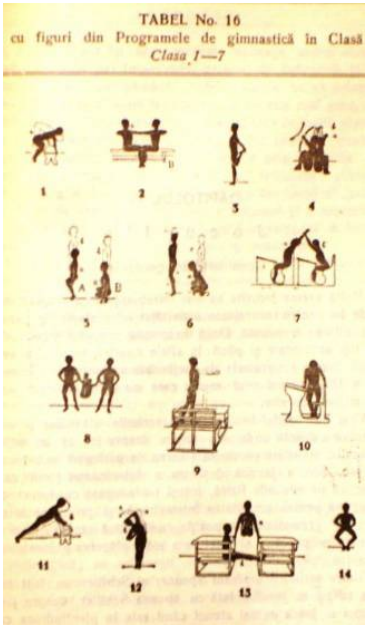


Fig. 4 – Gymnastic exercises for grades 1-7.

Chapter six is exclusively focused on games. General notions, physiological and pedagogical considerations, game rules, examples of active indoor and outdoor games such as ball over the net, ball in the basket and oina are presented. It deserves mentioning that the author did not elaborate sufficiently on the social advantages of this form of physical education or on the fact that games do not allow a precise dosage of effort and strict regulatory technical execution. This is why these aspects can be better achieved by exercises and activities specific to athletics and gymnastics (Bocu, 2007).

In chapter seven, various sports are described: athletics, sprinting, jumping, discus throw and shot put (Fig. 5).

Fig. 5 – Child throwing the shot put.

The final chapter presents the organization of sports training camps in order to put into practice, in an organized manner, the physical education of children.

The book comprises 333 pages.

The following annexes are found at the end of the book: the plan of a kindergarten playroom, the plan of a primary school gymnasium, plans of gymnastics apparatuses and the plan of a sports field.

Although the book's language has some archaic touches, these are adapted to physical education, for example: *cursa de iuţeală (speed race)*, *tracţiunea cu frânghia (rope pulling),* etc. This way of expression was specific to the interwar period and it was not the author's intention to use archaisms.

The following question can be posed: was a special book necessary to serve as a guide to children's physical education? The answer is positive, considering the serious situation of children's health. Comparative data evidence the fact that in the mid-interwar period (1930-1931), Romania ranked first among European countries with the highest infantile mortality rate (176‰). The next places were occupied, in decreasing order of mortality during the first year of life, by Hungary (154‰), Portugal (144‰), Czechoslovakia (138‰), Bulgaria (135‰) (Duţescu, Marcu, 1972). Certainly, sport itself does not directly reduce the mortality rate, but sport is an important factor in increasing resistance and thus, in prophylaxis.

To conclude, we consider it necessary to highlight some data of the author's biography. He was born in 1885. In the period 1918-1922, he was a sports teacher at the Military High School of Dealu Monastery. He was promoted to lieutenant colonel in 1925. In 1927, he trained and led the squad of military athletes to the International Inter-Allied Olympic Games. In 1930, he was promoted to colonel. Only one year later, he resigned from the army. However, he participated in World War II. In 1947, he was sent to reserve, and 3 years later, to retirement (Chiper, 2005).

It can be said that this book was useful for the acquisition of positive skills in the physical education of children. We also believe that this volume should be mentioned when presenting a historical review of children's physical education in the interwar period.

References

Bârsu C. Medico-historical aspects related to the foundation of the Medical Society of Physical Education from Bucharest, Palestrica of the Third Millennium, 2014; 15(1):152-157.

Bocu T. Activitatea fizică în viaţa omului contemporan, Editura Casa Cărţii de Ştiinţă, Cluj-Napoca, 2007, 63.

Chiper Gh. Veterani în slujba patriei, Ed. Buratino, Ploieşti, 2005, 63-65.

Duţescu B, Marcu N. Medicina în perioada dintre cele două războaie mondiale. În Istoria Medicinii Româneşti, Bologa VL, Brătescu G, Duţescu B, Milcu Şt. M (red.), Ed. Medicală, Bucureşti, 1972, 296.

Haţieganu I. Ce este medicina sportivă? Medicina sportivă, 1937;1(1):2.

Kiriţescu C. Educaţia fizică parte fundamentală a educaţiei şcolare integrale, Ed. Cartea Românească, Bucureşti, 1930, 125.

Websites

(1) Rusu F. Istoria educaţiei fizice şi a sportului. Available online from https://ro.scribd.com/doc/172516778/Istoria-Edicatiei-Fizicii-Si-a-Sportului Accessed in September 2016.

(2) Dragnea A., Stănescu M. Concepţii despre exerciţiile fizice şi importanţa acestora acordată în diverse epoci ale evoluţiei omenirii. În Teoria educaţiei fizice şi a sportului, ed. a II-a revăzută, 2002 Available online from https://romanialuiradu.files.wordpress.com/2015/02/dragnea-2002-teoria-ed-fizice-si-sportului.pdf Accessed in September 2016.

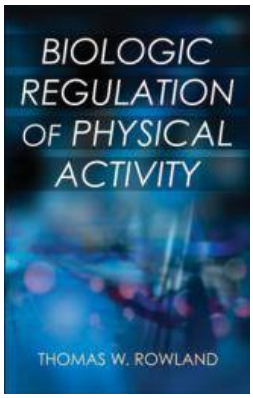
(3) https://ro.wikipedia.org/wiki/M%C4%83n%C4%83stirea_Dealu Accessed in September 2016.

Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 4, October-December 2016, 300–302

RECENT PUBLICATIONS

Book reviews

Biologic Regulation of Physical Activity
(Reglarea biologică a activităţii fizice)
Author: Thomas W. Rowland
Publishing House: Human Kinetics, October 2016
224 pages; Price: £65.99



As an already "old" book reviewer in the field of sports sciences, I am really enthusiastic when it happens to have the exciting opportunity of learning about a quite new, revolutionary hypothesis. Easy to understand, this type of opportunities cannot appear at every turn, but once you are blessed with one, the propensity to share it can no longer be suppressed. Such a feeling seems to be exactly what I have tasted very recently, when I first read about the last book of Dr. Thomas W. Rowland, one of the most respected pediatric cardiologists around the world, and a constant "fan" of studying and practicing physical exercise and sport; this is the book I have the pleasure to present to our readers this time.

In few words, the very new idea of the book speaks about the possibility of existence of a central biologic controller (regulator) of physical activity, a mechanism in the brain which current research would suggest to involuntarily supervise and control all biological processes involved in and/or associated with physical activity.

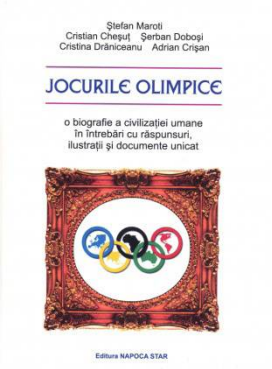
It is well known that not only in general but especially in cases like this, a comprehensive work addressing a new scientific topic has to provide the convincing evidence supporting the construction, with its rationale and structure and, finally, with its possible implications, from a theoretical and practical perspective. Well, as we will see in what follows, these rules are fully respected by the new book indeed. Thus, in its very consistent first part (8 chapters), the readers are guided through an impressive number of human and animal studies, which both in part and as a whole argue for the existence of a biologic regulator. It is a section in which the evidence is presented from a multi- and interdisciplinary perspective, taking into consideration that the collected research covers apparently disparate topics; from behavioral disorders to brain damage, and from lifetime activity patterns to gender differences.

The second part consists of just two chapters and addresses possible explanations for the control of energy output through activity, the rationale being the "law" of maintaining the energy in - energy out balance. This means that similarly to the way in which the body regulates the appetite, the programmed need for energy balance would lead to (physical) activity regulation.

The last three chapters (part III) deal with some potential implications that current data and constructions might have in the problem of physical inactivity, the calamity with which human beings are increasingly confronted nowadays. And this because if a biologic controller of activity exists indeed, then along with or independently of environmental factors manipulation, it could become a special and very efficient help in fighting against the obesity epidemic.

Gheorghe Dumitru
gdumitru@seanet.ro

The Olympic Games, a biography of human civilization with questions and answers, unique illustrations and documents
(Jocurile Olimpice, o biografie a civilizației umane în întrebări cu răspunsuri, ilustrații și documente unicat)
Authors: Ștefan Maroti, Cristian Cheșuț, Șerban Doboși, Cristina Drăniceanu, Adrian Crișan
Publishing House: Napoca Star, Cluj-Napoca, 2016
180 pages & 25 official posters of the Olympic Games



Before the 2016 Rio de Janeiro Olympic Games, alongside the extensive and varied information on Olympic topics provided by television reports, radio programs, print media articles, published books, etc., the monograph "The Olympic Games, a biography of human civilization with questions and answers, unique illustrations and documents" attracted our attention. Through its content and way of approaching the Olympic phenomenon from a multidisciplinary perspective, this proved to be an original and interesting book in many respects. Its authors are professors of physical education and other specialties, visual artists, managers who, besides their profession, have had for some time an interest in the knowledge and promotion of Olympism and the Olympic movement. This has allowed them to present and analyze the Olympic phenomenon in its complementarity, not only from the viewpoint of a sports specialist, but also from the perspective of other fields.

In their approach, the authors were guided by the fact that education in the Olympic spirit is a component of general education that contributes to the formation and development of an individual's personality. For the identification, knowledge, promotion of Olympism and the acquisition of competences on which Olympic culture is built, alongside institutions and trainers, consistent and varied bibliographic material on this topic is required. This was one of the main reasons that led the authors to write this book.

In the book pages, the reader is offered information about the ancient Olympic Games, the revival of the Olympic Games in their modern form, the Winter Olympic Games, the Paralympic Games, the Youth Olympic Games, cities that hosted these competitions, the Olympic village, Olympic peace, the Olympic symbol, the Olympic flag, the Olympic anthem, the Olympic flame, the Olympic oath, Olympic mascots, the program of sports competitions and other events related to the Olympic Games, the opening, closing, awarding ceremony, medals, diplomas and badges awarded, the participation of women in the Olympic Games, problems related to the use of forbidden substances, the non-acceptance of any form of discrimination, Olympic boycotts, pictograms used as means of communication, the Olympic Museum. A special place in the pages of the book is reserved for the participation of Romanian athletes in the Olympic Games.

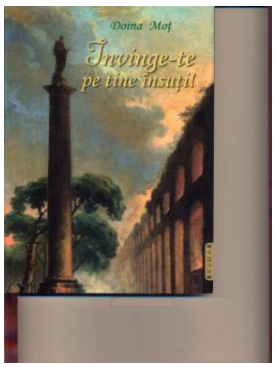
Through its ideas, the book helps those who read it to extend their knowledge of how sport is placed in the service of the young generation's harmonious development, peace and understanding between the peoples of the world, to know the activity of sports organizations that follow the Olympic principles, as well as the actions of Olympic movement members for the assertion and promotion of Olympism. Official posters of the Olympic Games, pictograms, mascots, other illustrations related to the Olympic topic complement the rich information through which the authors try to keep alive the legacy of Olympism and the Olympic movement. The book is completed with illustrations made by master students from the University of Art and Design Cluj-Napoca, which in addition to their informative content, represent a valuable artistic approach. In this context, the book offers an axiological space for search, knowledge, support, stimulation and promotion of Olympic values.

For their initiative, for what they accomplished, the authors fully deserve to be praised and honored. For what it offers through its content, through its graphic quality and way of presentation, the book recommends itself to be read.

Finally, it can be said that the result of the authors' work is a reference book on the Olympic topic, which is intended for pupils, students and other youths, for those who wish to better know different aspects related to Olympism, the Olympic movement and Olympic Games, as well as for parents, teaching staff, trainers and all those who play a role in imparting education in the Olympic spirit.

Traian Bocu
traian_bocu@yahoo.com

Conquer yourself
(Învinge-te pe tine însuţi)
Author: Doina Moţ
Publishing House: Brumar, Timişoara, 2016
192 pages; Price 20 lei



The book of Doina Moţ "Conquer yourself" is an invitation to reflection on Olympic values in the context of postmodern society.

Olympic exhortations such as "Citius, Altius, Fortius!"; "Conquer thyself!"; "Victory is not important, but the road to it is!"; "May the best win!"; "Sportsmanship does not exist without education!"; "Perfection can only be attained through merit" are paradigms that mediate the exchange of ideas between twenty opinion-making intellectuals in Timisoara, brought together by Doina Moţ.

The dimly colored front cover, without contrast, symbolically places us in the ancient world as the primary source of the Olympic movement. The cover sleeve shows the author in a stance suggesting that of a hostess awaiting her guests with pleasure and gratitude for the favorite story. The enclosed biographical data impose admiration, respect and appreciation for a lifetime's work in high performance sport, teaching, literature and civism.

The fourth cover cites an explanatory text by Epictetus on self-knowledge endeavor and presents a medal, symbol of Olympic reward obtained by Olympic winners. The fourth cover sleeve mentions six Olympic exhortations, which guide Olympic work and represent the common thread of the book, followed by the author.

The work extends over 192 pages as an "argument" and two chapters.

The argument consists of a pleasant and instructive pleading to use Olympism in school as an educational and formative means.

The first chapter, written in a fluent, didactic and credible style, thrills the reader with the personal experiences and unpublished information it conveys. This chapter also highlights the opinions of Nobel laureates in science and art or sport, friendship and freedom. This chapter projects the entire philosophy of the author, who wishes for an ideal regulation of social relations through Olympism.

The second chapter of the book is dedicated to friends. Depending on experiences, readings, attitudes or other criteria, as in a referendum, they reinforce the confidence in the Olympic ideal and the hope for an individual's becoming in an education system based on ethical values.

Respecting a genuine qualitative research methodology, Doina Moţ presents in the afterword of the book, in the form of conclusions, the key points arising from the content of this and previous books. The volume attains an Olympic characteristic: unity in diversity.

Alexandru Mureşan
ducumuresan@yahoo.com

Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 4, October-December 2016, 303–304

SCIENTIFIC MEETINGS

Ethnic diversity in the history of medicine in Cluj
Doctors serving human health - Highlights and models in Cluj

Diversitatea etnică în istoria medicinii în Cluj
Doctori care deservesc sănătatea umană - Personalități și modele în Cluj

The symposium *Ethnic diversity in the history of medicine in Cluj. Doctors serving human health. Highlights and models in Cluj* was held on October 25, 2016, in the Multimedia hall of the "Iuliu Haţieganu" University of Medicine and Pharmacy in Cluj-Napoca. This event was organized by "Iuliu Haţieganu" University of Medicine and Pharmacy and by the "Academician Nicolae Cajal" Foundation, with the help of the "Filderman Foundation".

This scientific meeting aimed to present an unexplored topic in the history of the Cluj School of Medicine and Pharmacy, which is also very little investigated in the Romanian history of medicine and pharmacy: ethnic diversity.

The moderators of the symposium were: Prof. Dr. Dan Dumitraşcu – Vice-Rector of "Iuliu Haţieganu" University of Medicine and Pharmacy, and Assoc. Prof. Dr. Cristian Bârsu - President of the Cluj branch of the Romanian Society of the History of Medicine.

The program consisted of the following oral presentations:

1) Prof. Dr. Petre Mircea. Iuliu Haţieganu's humanism evidenced by his medical and social achievements.

2) Prof. Dr. Dan Dumitraşcu. Participation of physicians from various ethnic groups in several editions of the Winter Exhibition of Physicians in Cluj-Napoca.

3) Assoc. Prof. Dr. Horaţiu Rotaru and Prof. Dr. Alexandru Rotaru. Ethnic problems between general and particular aspects in dental education in Cluj.

4) Prof. Dr. Şandor Vlaicu. An example of multilingualism in the history of the Cluj Medical School - Prof. Dr. Barbu Cuparencu.

5) Prof. Dr. Aristotel Cocârlă. Ethnic collaboration in the activity of the Occupational Diseases Clinic in Cluj.

6) Prof. Dr. Honorius Popescu and Prof. Dr. Valentin Zaharia. Pharm. Ion Simiti (1928-1997) - a professor, scientist and organizer.

7) Dr. Oana Habor ("Babes-Bolyai" University). Transylvanian Romanian students at the Faculty of Medicine of "Franz Joseph" University in Cluj (1876-1918).

8) Assoc. Prof. Dr. Călin Lazăr. Communication and interethnic relations in healthcare.

9) Assist. Prof. Dr. Veronica Trombiţaş and Prof. Dr. Silviu Albu. Good value cooperation between the majority and ethnic minorities in the implementation of the right to health care.

10) Assoc. Prof. Dr. Cristian Bârsu. The contributions of Iuliu Orient, Valeriu Lucian Bologa and Samuel Izsák in founding the Museum of History of Pharmacy in Cluj

Each presentation focused on significant aspects of ethnic diversity in the Cluj medical history, especially in the Cluj School of Medicine and Pharmacy. The landmarks of the existing interethnic communication within this medical and pharmaceutical School were highlighted. Also, different models of collaboration between doctors from various ethnic groups, involving health promotion in the 20th century, were mentioned.

The conclusion of the symposium was that ethnic diversity was and continues to be respected and encouraged in the field of medicine and pharmacy in Cluj. In this context, physicians' humanism was present and continues to be a landmark in the treatment of patients, regardless of their ethnicity.

This scientific event was attended by a large audience, including Prof. Sandu Bologa (Canada), Prof. Dr. Traian Bocu (Editor-in-Chief of the "Palestrica of the Third Millennium – Civilization and Sport" journal) and also, students from the Faculty of Medicine in Cluj.

The symposium was associated with an interesting exhibition on the same topic.

Cristian Bârsu
Department of Abilities, Social Sciences
and History of Medicine
Iuliu Haţieganu University of Medicine
and Pharmacy, Cluj-Napoca
cristian.barsu@umfcluj.ro

The audience at the Symposium

The exhibition

The International Scientific Conference of the Faculty of Movement, Sports and Health Science - Bacău - 6th Edition

Conferința Științifică Internațională a Facultății de Mișcare, Sport și Științe ale Sănătății - Bacău - Ediția a 6-a

From 11 to 12 November 2016, at the Faculty of Movement, Sports and Health Science of *Vasile Alecsandri* University in Bacau, scientific events were organized by the International Scientific Conference on *Achievements and prospects in the field of physical education and sports within the interdisciplinary European education system*.

The scientific event was organized in collaboration with "Alexandru Ioan Cuza" University, following a contract signed four years before. The 6th edition of the conference had a wide audience, registering 110 scientific papers elaborated by 150 authors from 38 universities, schools and sports organizations in Romania and 10 papers by foreign authors (France, Spain, Czech Republic, Slovakia, Slovenia, Serbia, Ireland, Turkey, United Arab Emirates and the Republic of Moldova).

The scientific meeting had the official opening on 11 November 2016 and comprised three workshops on different topics:

W1 - FIEP *and integrations in international networks and projects*. Prof. Branislav Antal, Prof. Dr. George Balint.

W2 - *The importance of using neuro-proprioceptive facilitation techniques in practical activity of physiotherapists*. Assoc. Prof. Dr. Gabriela Ochiană.

W3 - *The role of the National Association of Occupational Therapy to support future specialists*. Assoc. Prof. Dr. Marinela Rață.

The opening of the scientific event took place on 12 November 2016 at 10:00, in *Vasile Alecsandri Aula* of Bacau University. The meeting was attended by personalities in the field and representatives of prestigious national and international institutions: President of the Senate of *Vasile Alecsandri* University Bacau - Eng. Prof. Dr. Honoris Causa Valentin Nedeff; Rector of *Vasile Alecsandri* University Bacau - Eng. Prof. Dr. Carol Shnacovsky; President of the Senate of the *National Physical Education University Bucharest* - Prof. Dr. Honoris Causa Viorel Cojocaru; Vice-President of the *European Federation of Physical Education* and Vice-President of the *International Federation of Physical Education* - Prof. Dr. Branislav Antal; Dean of the *Faculty of Movement, Sports and Health Bacău*, chairman of the conference – Assoc. Prof. Dr. Bogdan Constantin Rață; Dean of *Alexandru Ioan Cuza University Iasi, Faculty of Physical Education and Sport*. The chairman of the conference was Assoc. Prof. Dr. Beatrice Abălaşei.

The conference was organized and moderated by Prof. Dr. Tatiana Dobrescu, chairman of the conference organizing committee and Vice-Dean of research management, national and international relations of the faculty.

In the plenum of the conference, Professor Dr. Tatiana Dobrescu was awarded the Diploma of Merit by the President of the *International Federation of Physical Education and Sport*, and from the part of the *Society for Science, Human Excellence and University Sports,* she was awarded the title of *Laureate of Science, Human Excellence and University Sports of Romania* for her entire contribution to science sustainability through research competition, education and sports management, nationally and internationally.

The papers presented in the plenary session were: Determination of female table tennis sport performance by sensory motor reaction time - Prof. Dr. Jaromir Sedlacek, Slovakia; The effects of cryotherapy using cold air stream at -30° C on soft tissues in various musculoskeletal disorders - Assoc. Prof. Dr. Lucian Dobreci, Romania; Measuring the daily energy expenditure related to physical activity in healthy adults by actigraphy in subacute and post-stroke patients: a comparative study - Assoc Prof. Dr. Stéphane Mandigout, France.

A scientific competition was organized in three sections, based on evaluation committees and specially designed scales. Evaluation was made by marks and based on them, diplomas were handed.

Alexandru Mureșan
ducumuresan@yahoo.com

Palestrica of the third millennium – Civilization and Sport
Vol. 17, no. 4, October-December 2016, 305–306

EVENTS

Autumn cross-country running races for students continue in Răchiţele-Mărgău (6th ed.) and Frata (2nd ed.)

La Răchiţele-Mărgău (ed. a 6-a) şi Frata (ed. a 2-a), continuă crosurile de toamnă ale elevilor

As a novelty compared to last year, this year's cross-country running race in Răchiţele (Mărgău commune), entitled "The Bride's Veil", was also attended by preparatory (zero) grade and 1st grade pupils. It should be reminded that teams participating in the Răchiţele-Mărgău Cross-Country Running Race come predominantly from the mountain area of Cluj county, while participation from other areas is not restricted. The number of participants in the Răchiţele race was as high as last year, while the number of those attending the Frata race doubled compared to last year. The increased interest of the organizing schools' management, local authorities and teachers in this event was reflected in the higher quality of this year's races. The collaboration between the Cluj County School Inspectorate and the Romanian Medical Society of Physical Education and Sport through the Palestrica of the Third Millennium – Civilization and Sport journal in creating emulation for this form of health prevention through participation in cross-country running races in Cluj county has started to pay off. An increasing number of students attend these sports events organized, for the time being, for middle schools in rural areas.

The results were as follows:

Răchiţele-Mărgău

Participating schools: Sâncraiu, Răchiţele, Beliş, Mănăstireni, Poieni, Mărişel, Săcuieu, Râşca and Huedin.

General ranking: I – Middle School Sâncraiu, II – Middle School Răchiţele, III – Middle School Beliş.

First place for all age categories: preparatory grade and first grade boys (Abrudan Bogdan Vlăduţ) -Mănăstireni; 3rd-4th grade girls (Okos-Rigo Aliz) - Sâncraiu; 3rd-4th grade boys (Lukacs Aron) - Sâncraiu; 5th-6th grade girls (Szöcs Imola) - Sâncraiu; 5th-6th grade boys (Paşca Cristian) - Poieni; 7th-8th grade girls (Turău Paula-Diana) - Poieni; 7th-8th grade boys (Cora Dragoş Şerban) - Poieni

Team leading teachers: Middle School Răchiţele - Roşu Claudiu Ilie; Middle School Mănăstireni - Todoran Rareş; Middle School Poieni - Potra Marian; "Ady Endre" Middle School Sâncraiu - Csudom Norbert; "Avram Iancu" Middle School Beliş - Todea Anghel; Middle School Râşca - Ilea Ardelean; "Pelaghia Roşu" Middle School Mărişel - Neag Simina; Middle School Săcuieu - Crişan Aurel; Middle School Huedin - Pavel Cosmin.

Local officials: Alexandra Roşu – director of Middle School Mărgău; Petru Ungur – mayor of Mărgău commune.

Preparation of teams participating in the race for the opening ceremony

At the start of the race

Registration of competitors upon arrival

Opening of the award ceremony by school director Alexandra Roşu, in the presence of the mayor of Mărgău commune, Petru Ungur

Prize awarding – 7th-8th grade girls

Awarding of prizes to teachers (on the podium from left to right): Claudiu Roşu, Csudom Norbert, Anghel Todea, by the mayor of the Mărgău commune, Petru Ungur (first to the right)

Frata

Participating schools: Frata, Cămărașu, Soporu de Câmpie, Mociu, Luna, Căianu, Luncani, Boian.

General ranking: I – Middle School Frata, II – Middle School Cămărașu, III – Middle School Soporu de Câmpie.

First place for all age categories: 5th-6th grade boys (Pop Damian) - Frata; 5th-6th grade girls (Trif Nicoleta) - Frata; 7th-8th grade boys (Mocean Marian) - Cămărașu; 7th-8th grade girls (Marina Andra) – Cămărașu.

Team leading teachers: Middle School Frata - Popa Sebastian; Middle School Cămărașu - Lăpuște Sorina; Middle School Soporu de Cîmpie - Pașca Tușa Maria; Middle School Mociu - Donea Tudor; Middle School Luna - Olar Maria; Middle School Luncani - Cservenecz Iuliu; Middle School Căianu - Brata Valentin; Middle School Boian – Toth Mihai.

Local officials: Teodor Bara - director; Vasile Trif – mayor

Cristian Potora
cristianpotora@gmail.com

Start in the 5th-6th grade girls' race

View of the 7th-8th grade girls' race

Start in the 7th-8th grade boys' race

Registration of competitors upon arrival

Award ceremony – 5th-6th grade boys, conducted by school director Teodor Bara

The 8 team leading teachers (from left to right): Mihai Toth, Iuliu Cservenecz, Maria Olar, Valentin Brata, Dorina Lăpuște, Sebastian Popa, Maria Pașca Tușa, Tudor Donea

Palestrica of the third millennium – Civilization and sport
Vol. 17, no. 4, October-December 2016, 307–309

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).

SUBSCRIPTION COSTS

The "Palestrica of the Third Millennium" journal is printed quarterly. The subscription price is 100 EUR for institutions abroad and 50 EUR for individual subscribers outside Romania. For Romanian institutions, the subscription price is 120 RON, and for individual subscribers the price is 100 RON. Note that distribution fees are included in the postal costs.

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

Title of the journal: Palestrica of the third millennium – Civilization and sport

pISSN: 1582-1943; eISSN: 2247-7322; ISSN-L: 1582-1943

Profile: a Journal of Study and interdisciplinary research

Editor: "Iuliu Haţieganu" University of Medicine and Pharmacy of Cluj-Napoca and The Romanian Medical Society of Physical Education and Sports in collaboration with the Cluj County School Inspectorate

The level and attestation of the journal: a journal rated B+ by CNCSIS in the period 2007-2011 and certified by CMR since 2003

Journal indexed into International Data Bases (IDB): EBSCO, Academic Search Complete, USA and Index Copernicus, Journals Master List, Poland; DOAJ (Directory of Open Access Journals), Sweden.

Year of first publication: 2000

Issue: quarterly

The table of contents, the summaries and the instructions for authors can be found on the internet page: http://www.pm3.ro. Access to the table of contents and full text articles (in .pdf format) is free.

ÎN ATENŢIA COLABORATORILOR

Tematica revistei

Ca tematică, revista are un caracter multidisciplinar orientat pe domeniile biomedical, sănătate, efort fizic, ştiinţe sociale, aplicate la activităţile de educaţie fizică şi sport, astfel încât subiectele tratate şi autorii aparţin mai multor specialităţi din aceste domenii. Principalele rubrici sunt: „Articole originale" şi „Articole de sinteză".

Exemplificăm rubrica „Articole de sinteză" prin temele importante expuse: stresul oxidativ în efortul fizic; antrenamentul mintal; psihoneuroendocrinologia efortului sportiv; cultura fizică în practica medicului de familie; sporturi extreme şi riscuri; determinanţi emoţionali ai performanţei; recuperarea pacienţilor cu suferinţe ale coloanei vertebrale; sindroame de stres şi psihosomatică; educaţia olimpică, aspecte juridice ale sportului; efortul fizic la vârstnici; tulburări ale psihomotricităţii; pregătirea sportivă la altitudine; fitness; biomecanica mişcărilor; testele EUROFIT şi alte metode de evaluare a efortului fizic; reacţii adverse ale eforturilor; endocrinologie sportivă; depresia la sportivi; dopajul clasic şi genetic; Jocurile Olimpice etc.

Dintre articolele consacrate studiilor şi cercetărilor experimentale notăm pe cele care vizează: metodica educaţiei fizice şi sportului; influenţa unor ioni asupra capacităţii de efort; profilul psihologic al studentului la educaţie fizică; metodica în gimnastica sportivă; selecţia sportivilor de performanţă.

Alte articole tratează teme particulare vizând diferite sporturi: înotul, gimnastica ritmică şi artistică, handbalul, voleiul, baschetul, atletismul, schiul, fotbalul, tenisul de masă şi câmp, luptele libere, sumo.

Autorii celor două rubrici de mai sus sunt medici, profesori şi educatori din învăţământul universitar şi preuniversitar, antrenori, cercetători ştiinţifici etc.

Alte rubrici ale revistei sunt: editorialul, actualităţile editoriale, recenziile unor cărţi - ultimele publicate în domeniu, la care se adaugă şi altele prezentate mai rar (invenţii şi inovaţii, universitaria, preuniversitaria, forum, remember, calendar competiţional, portrete, evenimente ştiinţifice).

Subliniem rubrica "Memoria ochiului fotografic", unde se prezintă fotografii, unele foarte rare, ale sportivilor din trecut şi prezent.

De menţionat articolele semnate de autori din Republica Moldova privind organizarea învăţământului sportiv, variabilitatea ritmului cardiac, etapele adaptării la efort, articole ale unor autori din Franţa, Portugalia, Canada.

Scopul principal al revistei îl constituie valorificarea rezultatelor activităţilor de cercetare precum şi informarea permanentă şi actuală a specialiştilor din domeniile amintite. Revista îşi asumă şi un rol important în îndeplinirea punctajelor necesare cadrelor didactice din învăţământul universitar şi preuniversitar precum şi medicilor din reţeaua medicală (prin recunoaşterea revistei de către Colegiul Medicilor din România), în avansarea didactică şi profesională.

Un alt merit al revistei este publicarea obligatorie a cuprinsului şi a câte unui rezumat în limba engleză, pentru toate articolele. Frecvent sunt publicate articole în extenso într-o limbă de circulaţie internaţională (engleză, franceză).

Revista este publicată trimestrial iar lucrările sunt acceptate pentru publicare în limba română şi engleză. Articolele vor fi redactate în format WORD (nu se acceptă articole în format PDF). Expedierea se face prin e-mail sau pe dischetă (sau CD-ROM) şi listate, prin poştă pe adresa redacţiei. Lucrările colaboratorilor rezidenţi în străinătate şi ale autorilor români trebuie expediate pe adresa redacţiei:

Revista «Palestrica Mileniului III»
Redactor şef: Prof. dr. Traian Bocu
Adresa de contact: palestrica@gmail.com sau traian_bocu@yahoo.com
Adresa poştală: Str. Clinicilor nr.1 cod 400006, Cluj-Napoca, România
Telefon:0264-598575
Website: www.pm3.ro

Obiective

Ne propunem ca revista să continue a fi o formă de valorificare a rezultatelor activităţii de cercetare a colaboratorilor săi, în special prin stimularea participării acestora la competiţii de proiecte. Menţionăm că articolele publicate în cadrul revistei sunt luate în considerare în procesul de promovare în cariera universitară (acreditare obţinută în urma consultării Consiliului Naţional de Atestare a Titlurilor şi Diplomelor Universitare).

Ne propunem de asemenea să încurajăm publicarea de studii şi cercetări, care să cuprindă elemente originale relevante mai ales de către tineri. Toate articolele vor trebui să aducă un minimum de contribuţie personală (teoretică sau practică), care să fie evidenţiată în cadrul articolului.

În perspectivă ne propunem îndeplinirea criteriilor care să permită promovarea revistei la niveluri superioare cu recunoaştere internaţională.

STRUCTURA ŞI TRIMITEREA ARTICOLELOR

Manuscrisul trebuie pregătit în acord cu prevederile Comitetului Internaţional al Editurilor Revistelor Medicale (http://www.icmjee.org).

Numărul cuvintelor pentru formatul electronic:

– 4000 cuvinte pentru articolele originale,
– 2000 de cuvinte pentru studiile de caz,
– 5000–6000 cuvinte pentru articolele de sinteză.

Format pagină: redactarea va fi realizată în format A4. Paginile listate ale articolului vor fi numerotate succesiv de la 1 până la pagina finală.

Font: Times New Roman, mărime 11 pt.; redactarea se va face pe pagina întreagă, cu diacritice, la două rânduri, respectând margini egale de 2 cm pe toate laturile.

Ilustraţiile:

Figurile (grafice, fotografii etc.) vor fi numerotate consecutiv în text, cu cifre arabe. Vor fi editate cu programul EXCEL sau SPSS, şi vor fi trimise ca fişiere separate: „figura 1.tif", „figura 2. jpg", iar la solicitarea redacţiei şi în original. Fiecare grafic va avea o legendă care se trece **sub** figura respectivă.

Tabelele vor fi numerotate consecutiv în text, cu cifre romane, şi vor fi trimise ca fişiere separate, însoţite de o legendă ce se plasează **deasupra** tabelului.

PREGĂTIREA ARTICOLELOR

1. Pagina de titlu: – cuprinde titlul articolului (maxim 45 caractere), numele autorilor urmat de prenume, locul de muncă, adresa postală a instituţiei, adresa poştală şi adresa e-mail a primului autor. Va fi urmat de titlul articolului în limba engleză.

2. Rezumatul: Pentru articolele experimentale este necesar un rezumat structurat (Premize-Background, Obiective-Aims, Metode-Methods, Rezultate-Results, Concluzii-Conclusions), în limba română, de maxim 250 cuvinte (20 de rânduri, font Times New Roman, font size 11), urmat de 3–5 cuvinte cheie (dacă este posibil din lista de termeni consacraţi). Toate articolele vor avea un rezumat în limba engleză. Nu se vor folosi prescurtări, note de subsol sau referinţe.

Premize şi obiective: descrierea importanţei studiului şi precizarea premizelor şi obiectivelor cercetării.

Metodele: includ următoarele aspecte ale studiului:

Descrierea categoriei de bază a studiului: de orientare sau aplicativ.

Localizarea şi perioada de desfăşurare a studiului. Colaboratorii vor prezenta descrierea şi mărimea loturilor, sexul (genul), vârsta şi alte variabile socio-demografice.

Metodele şi instrumentele de investigaţie folosite.

Rezultatele vor prezenta datele statistice descriptive şi inferenţiale obţinute (cu precizarea testelor statistice folosite): diferenţele dintre măsurătoarea iniţială şi cea finală, pentru parametri investigaţi, semnificaţia coeficienţilor de corelaţie. Este obligatorie precizarea nivelului de semnificaţie (valoarea ***p*** sau mărimea efectului ***d***) şi a testului statistic folosit etc.

Concluziile care au directă legătură cu studiul prezentat.

Articolele de orientare şi studiile de caz vor avea un rezumat nestructurat (fără a respecta structura articolelor experimentale) în limita a 150 cuvinte (maxim 12 rânduri, font Times New Roman, font size 11).

3. Textul

Articolele experimentale vor cuprinde următoarele capitole: Introducere, Ipoteză, Materiale şi Metode (inclusiv informaţiile etice şi statistice), Rezultate, Discutarea rezultatelor, Concluzii (şi propuneri). Celelalte tipuri de articole, cum ar fi articolele de orientare, studiile de caz, editorialele, nu au un format impus.

Răspunderea pentru corectitudinea materialelor publicate revine în întregime autorilor.

4. Bibliografia

Bibliografia va cuprinde:

Pentru articole din reviste sau alte periodice se va menţiona: numele tuturor autorilor şi iniţialele prenumelui, anul apariţiei, titlul articolului în limba originală, titlul revistei în prescurtare internaţională (caractere italice), numărul volumului, paginile

Articole: Pop M, Albu VR, Vişan D et al. Probleme de pedagogie în sport. Educaţia Fizică şi Sportul 2000; 25(4):2-8.

Cărţi: Drăgan I (coord.). Medicina sportivă aplicată. Ed. Editis, Bucureşti 1994, 372-375.

Capitole din cărţi: Hăulică I, Bălţatu O. Fiziologia senescenţei. În: Hăulică I. (sub red.) Fiziologia umană. Ed. Medicală, Bucureşti 1996, 931-947.

Începând cu revista 4/2010, fiecare articol va trebui să se bazeze pe un minimum de 15 şi un maximum de 100 referinţe bibliografice, în majoritate articole nu mai vechi de 10 ani. Sunt admise un număr limitat de cărţi şi articole de referinţă (1-3), cu o vechime mai mare de 10 ani. Un procent de 20% din referinţele bibliografice citate trebuie să menţioneze literatură străină studiată, cu respectarea criteriului actualităţii acesteia (nu mai vechi de 10 ani).

Procesul de recenzare (peer-review)

Într-o primă etapă toate materialele sunt revizuite riguros de cel puţin doi referenţi competenţi în domeniu respectiv (profesori universitari doctori şi doctori docenţi) pentru ca textele să corespundă ca fond şi formă de prezentare cerinţelor unei reviste serioase. După această etapă materialele sunt expediate referenţilor revistei, în funcţie de profilul materialelor. În urma observaţiilor primite din partea referenţilor, redacţia comunică observaţiile autorilor în vederea corectării acestora şi încadrării în cerinţele de publicare impuse de revistă. Acest proces (de la primirea articolului până la transmiterea observaţiilor) durează aproximativ 4 săptămâni. Cu această ocazie se comunică autorului daca articolul a fost acceptat spre publicare sau nu. În situaţia acceptării, urmează perioada de corectare a articolului de către autor în vederea încadrării în criteriile de publicare.

Conflicte de interese

Se cere autorilor să menţioneze toate posibilele conflicte de interese incluzând relaţiile financiare şi de alte tipuri. Dacă sunteţi siguri că nu există nici un conflict de interese vă rugăm să menţionaţi acest lucru. Sursele de finanţare ar trebui să

fie menţionate în lucrarea dumneavoastră.

Precizări

Precizările trebuie făcute doar în legătură cu persoanele din afara studiului, care au avut o contribuţie substanţială la studiul respectiv, cum ar fi anumite prelucrări statistice sau revizuirea textului în limba engleză. Autorii au responsabilitatea de a obţine permisiunea scrisă din partea persoanelor menţionate cu numele în cadrul acestui capitol, în caz că cititorii se referă la interpretarea rezultatelor şi concluziilor acestor persoane. De asemenea, la acest capitol se vor face precizări în cazul în care articolul valorifică rezultate parţiale din anumite proiecte sau dacă acesta se bazează pe teze de masterat sau doctorat susţinute de autor, alte precizări.

Criterii deontologice

Redacţia va răspunde în timp util autorilor privind acceptarea, neacceptarea sau necesitatea modificării textului şi îşi rezervă dreptul de a opera modificări care vizează forma lucrărilor.

Nu se acceptă lucrări care au mai fost tipărite sau trimise spre publicare la alte reviste. Autorii vor trimite redacţiei odată cu articolul propus spre publicare, într-un fişier word separat, o declaraţie scrisă în acest sens, cu angajamentul respectării normelor deontologice referitoare la citarea surselor pentru materialele folosite (referinţe bibliografice, figuri, tabele, chestionare).

Pentru articolele originale, în conformitate cu îndeplinirea condiţiilor Declaraţiei de la Helsinki, a Protocolului de la Amsterdam, a Directivei 86/609/EEC şi a reglementărilor Comisiilor de Bioetică din locaţiile unde s-au efectuat studiile, autorii trebuie să prezinte:

- acordul informat din partea familiei, pentru studiile pe copii şi juniori;
- acordul informat din partea subiecţilor adulţi, pacienţi şi sportivi, pentru participare;
- adeverinţă de Malpraxis pentru medici, pentru cercetările/studiile pe subiecţi umani;
- adeverinţă din partea Comisiilor de Etică, pentru protocolul de studiu pe subiecţi umani;
- adeverinţă din partea Comisiilor de Bioetică, pentru protocolul de studiu pe animale.

Datele vor fi menţionate în articol la secţiunea Material şi metodă. Documentele vot fi obţinute înainte de începerea studiului. Se va menţiona şi numărul de înregistrare al adeverinţei din partea Comisiilor de Etică.

Materialele trimise la redacţie nu se restituie autorilor, indiferent dacă sunt publicate sau nu.

ÎN ATENŢIA SPONSORILOR

Solicitările pentru spaţiile de reclamă, vor fi adresate redacţiei revistei "Palestrica Mileniului III", Str. Clinicilor nr. 1, cod 400006 Cluj-Napoca, România. Preţul unei pagini de reclamă full color A4 pentru anul 2012 va fi de 250 EURO pentru o apariţie şi 800 EURO pentru 4 apariţii. Costurile publicării unui Logo pe coperţile revistei, vor fi stabilite în funcţie de spaţiul ocupat. Plata se va face în contul Societăţii Medicale Române de Educaţie Fizică şi Sport, CIF 26198743. Banca Transilvania, sucursala Cluj Cod IBAN: RO32 BTRL 0130 1205 S623 12XX (LEI).

ÎN ATENŢIA ABONAŢILOR

Revista "Palestrica Mileniului III" este tipărită trimestrial, preţul unui abonament fiind pentru străinătate de 100 Euro pentru instituţii, şi 50 Euro individual. Pentru intern, preţul unui abonament instituţional este de 120 lei, al unui abonament individual de 100 lei. Menţionăm că taxele de difuzare poştală sunt incluse în costuri.

Plata abonamentelor se va face prin mandat poştal în contul Societăţii Medicale Române de Educaţie Fizică şi Sport, CIF 26198743. Banca Transilvania, sucursala Cluj Cod IBAN: RO32 BTRL 0130 1205 S623 12XX (LEI); RO07 BTRL 01304205 S623 12XX (EURO); RO56 BTRL 01302205 S623 12XX (USD). SWIFT: BTRLRO 22

Precizăm că începând cu anul 2010 a fost introdusă taxa de articol. Ca urmare, toţi autorii semnatari ai unui articol vor achita împreună suma de 150 Lei, în contul Societăţii Medicale Române de Educaţie Fizică şi Sport publicat mai sus.

Autorii care au abonament vor fi scutiţi de această taxă de articol.

Alte informaţii se pot obţine online de pe www.pm3.ro „Pentru autori" sau pe adresa de mail a redacţiei palestrica@gmail.com sau pe adresa poştală: Str. Clinicilor nr.1 cod 400006, Cluj-Napoca, România, Telefon:0264-598575.

INDEXAREA

Titlul revistei: Palestrica Mileniului III – Civilizaţie şi sport

pISSN: 1582-1943; eISSN: 2247-7322; ISSN-L: 1582-1943

Profil: revistă de studii şi cercetări interdisciplinare

Editor: Universitatea de Medicină şi Farmacie „Iuliu Haţieganu" din Cluj-Napoca şi Societatea Medicală Română de Educaţie Fizică şi Sport, în colaborare cu Inspectoratul Şcolar al Judeţului Cluj

Nivelul de atestare al revistei: revistă acreditată în categoria B+ de CNCS în perioadele 2007-2011 şi atestată CMR din anul 2003 şi în prezent

Revistă indexată în Bazele de Date Internaţionale (BDI): EBSCO, Academic Search Complete, USA şi Index Copernicus, Journals Master List, Polonia, DOAJ (Directory of Open Access Journals), Sweden

Anul primei apariţii: 2000

Periodicitate: trimestrială

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.

AUTHORS' ALPHABETICAL INDEX
who published during 2016, in "Palestrica of the Third Millennium" journal – vol. 17, nr. 1; 2, 3; 4*

* Interpretare: 17-2016/1:1 = Volumul - Anul apariţiei / Numărul revistei : Pagina