PALESTRICA OF THE THIRD MILLENNIUM
CIVILIZATION AND SPORT

PALESTRICA MILENIULUI III
CIVILIZAŢIE ŞI 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
and certified by CMR (Romanian College of Physicians) since 2003

A journal with a multidisciplinary approach in the fields of biomedical science, health, 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

3

Vol. 15, No. 3, July-September 2014

Palestrica of the third millennium – Civilization and sport
Palestrica Mileniului III – Civilizaţie şi Sport
Vol. 15, no. 3, July-September 2014

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

Contents

Cuprins

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 179–180

EDITORIAL

The spirit of sport at the beginning of the Millennium
Spiritul sportiv la început de mileniu

Iuliu Ovidiu Marian
Centre for Research in Electrochemistry, Faculty of Chemistry and Chemical Engineering, "Babeş-Bolyai" University Cluj-Napoca
iulomar@yahoo.com

The changes of olympic and international regulations, as well as the appearance of new sporting disciplines, may involve the reconsideration of some concepts related to the spirit of sport. There is no doubt that competitive sport involves particular physical and intellectual stress. The effort of Pheidippides who ran almost 240 km including the marathon is notable. He paid with his death, but this is an edifying example for the future of the spirit of sport. It is not known whether he used stimulants or he had just an extremely good physical condition and biochemical status. However, we know that such performance involves serious training and a Spartan selection for that time (even if Pheidippides was Athenian). Recent biomedical, pharmaceutical, biomechanical and psychological research sheds a completely new light on the sacrifice of the Greek athlete. In this context, a brief analysis of the main characteristics that currently define the spirit of sport is attempted.

The athlete's health must be perfect, because risk factors during the competition are obviously different from those found in ordinary situations. A rigorous analysis of the London marathon in the period 1981-2004 correlated with the number of runners (32,000) shows that there were 8 deaths. One was due to a cerebrovascular accident (subarachnoid hemorrhage), 2 were due to hypertrophic cardiomyopathy, and 5 to coronary heart disease (Tunstall Pedoe, 2004). Death occurred during the race, right after its finish, or within 24 hours from the race. The same author, through a normalized calculation including time and distance in relation to the number of participants, reports the risk of death in the London marathon, compared to the data provided by the European Council for the safety of travels over the period 2001-2002. Only the number of motorcycle accidents (18) is higher than that of accidents due to the marathon (12), compared to bicycle accidents (3), car accidents (1), aircraft accidents (0.67), and motor racing accidents (0.08) recorded during the same time period. Data are really surprising, although the study refers to athletes aged over 30 years.

The human organism is an automatic self-regulation system. Under physical and mental stress conditions, the information avalanche through the reaction pathway leads to the exceeding of critical reference values. The mechanisms responsible for homeostasis no longer function optimally.

In the case of long distance runners, an intrinsic physiological damage from Na, K, Mg, Ca and Cl, an ion exchange disequilibrium in the cell membrane results. In the absence of intense physical exercise, ion concentrations remain practically at constant values through a yet unknown mechanism, which plays the role of a biological potentiostat. Initially, theoretical electrochemical studies published by Goldman (Goldman, 1943), Hodkin and Katz (1949) showed that the rest potential of a biological membrane is determined by the different concentrations of the ions Na^+, K^+ and Cl^- in the two aqueous solutions separated by the membrane. Planck's theory supposes a "constrained diffusion" through the liquid junction, by which the ion concentrations in each section of the junction layer remain constant in time (Sten-Knudsen, 2002).

Based on Planck's theory of diffusion potential across the membrane and using the integral Volterra equations, the contributions of the three ionic current densities in equilibrium were found (Bonciocat & Marian, 2005). The sum of these three contributions gives the expression of the rest potential and a comparison with the Goldman-Hodkin-Katz formula is made, showing in what conditions they become identical formulas.

However, all theoretical models refer only to the first approximations in stationary conditions. The theoretical aspects of all ion contributions including radical species in the exchange mechanism across the cell membrane under non-equilibrium conditions in the presence of stimulants and the synergy or catalytic effects induced by oligoelements remain unsolved for the moment. This is actually the case of long distance runners.

Radical and non-radical species derived from oxygen and nitrogen, due to their chemical affinity for target molecules, are responsible for cell tissue damage as a result of protein changes, lipid peroxidation, and DNA chain breakage. During the cyclic strain of muscle tissues and tendons, the maximum effort interval is associated with ischemia; consequently, when normal tissue oxygenation is resumed, the production of radical species is stimulated (Bestwick & Maffulli, 2004). Hyperthermia provides radicals through the activation of combined charge transfer

and diffusion processes, probably at mitochondrial level. The individual biochemical mechanism of adaptability to the generation of radicals is yet unclear both in ordinary persons and high performance athletes.

The character and education of athletes play a key role in sports competitions. In spite of educational differences depending on the belonging to a certain group, in institutional settings, elementary hygiene and behavior rules are respected. On the other hand, religious tolerance is involved in the relations between officials and athletes. In other words, xenophobia and intolerance are completely excluded from sports competitions. Any athlete who aspires to a title should possess a strong character and accept defeat with fair play. Without *self-respect and respect for the other participants*, excellence cannot be attained.

Commitment is another desideratum for an athlete. A recent editorial (Bocu, 2014) draws attention to the phenomenon of addiction, emphasizing the fact that in the case of high performance sport, exercise should be monitored by specialized medical teams. This addiction phenomenon is even more harmful in athletes who have ceased their activity, but still participate in competitions (see the marathon). In the absence of completely computerized medical surveillance, the organizers cannot monitor the participants. The perpetuation of addiction has multiple causes, of which two stand out. Competition itself involves complex wireless bioelectrochemical monitoring and the cost of equipment is still prohibitive. However, elderly athletes are encouraged to participate in marathon competitions. The case of the old athlete Fauja Singh, aged 93, who finished the London marathon in 2004 in 6 hours and 7 minutes, is well known.

Does *solidarity* in hazard situations that sometimes have tragic consequences involve the cancellation of a competition? It is difficult to believe that after the death of a teammate, considering the *team spirit*, the other members of the team can mobilize themselves. Psychologists maintain that it is in these situations that courage manifests.

The courage to attack the limits of one's own and the competitors' capacities is another determining factor in promoting the spirit of sport.

We left for last some controversial aspects. Any high performance athlete who respects Olympism aspires to *excellence*. In order to achieve this desideratum, are we (unfortunately) subject to cheating, Săvulescu et al., 2004 (Oxford University) wondered in an essay on *ethics, fair play and honesty*. The analysis refers to the forbiddance or the control of the administration of chemical, synthesis, natural chemical compounds (e.g. erythropoietin EPO stimulates the production of erythrocytes) and of hypoxic devices that develop biochemical reaction mechanisms specific for the individual. The conclusion allows to see the possibility of legalizing the consumption of chemical compounds under strict control, for the protection of athletes.

Finally, several questions are asked. We created the Paralympic Games. Do we separate the human species according to criteria related to genetics, accidents or bioengineering? What will be the performance of the living being assisted by bioservomechanisms, when such a biomechanical structure is controlled by the human brain? Will the far future require other separations? Another certainty is that new laws will be issued. The *respect for rules and laws* remains. This completes the spirit of sport.

References

Bestwick CS, Maffulli M. Reactive oxygen species and tendinopathy: do they matter? Br. J. Sports Med. 2004; 38(4):672-674.

Bocu T. Moderate exercise vs. physical exercise addiction. Palestrica of the third millennium - Civilization and sport, 2014; 15(1):7-8.

Bonciocat N, Marian IO. A new approach to the rest potential of biological membrane: J. Pharm. Biomed. Analysis, 2005; 37(5):831-838.

Goldman DE. Potential, impedance and rectification in membranes. J. Gen. Physiol. 1943; 27(1):37-60.

Hodkin AL, Katz B. The effect of sodium ions on the electrical activity of the giant axon of squid. J. Physiol. 1949; 108(1):37-77.

Săvulescu J, Foddy B, Clayton M. Why we should allow performance enhancing drugs in sport. Br. J. Sports Med. 2004; 38(4):666-670.

Sten-Knudsen O. Biological membranes, Theory transport, potentials, and electric impulses. ch.3. Membrane potential, Cambridge University Press, 2002.

Tunstall Pedoe DS. Sudden death risk in older athletes: increasing the denominator. Br. J. Sports Med. 2004;38(4):671-672.

Palestrica Mileniului III – Civilizaţie şi Sport
Vol. 15, no. 3, Iulie-Septembrie 2014, 181–182

EDITORIAL

Spiritul sportiv la început de mileniu
The spirit of sport at the beginning of the Millennium

Iuliu Ovidiu Marian
Centrul de cercetări în electrochimie, Facultatea de chimie şi inginerie chimică, Universitatea Babeş-Bolyai Cluj-Napoca
iulomar@yahoo.com

Modificările unor regulamente la nivel olimpic şi mondial, precum şi apariţia de noi discipline sportive, implică poate reconsiderări ale unor concepte legate de spiritul sportiv. Fără îndoială sportul practicat la nivel competiţional presupune un stres fizic şi intelectual deosebit. Efortul lui Feidipides care a alergat aproape 240 km incluzând maratonul este notabil. El a plătit cu viaţa, dar exemplul este edificator pentru viitorul spiritului sportiv. Nu ştim dacă a folosit sau nu stimulente, sau dacă era extrem de dotat din punct de vedere fizic şi biochimic. Ştim însă că o asemenea performanţă presupune un antrenament serios şi pentru acele vremuri, o selecţie spartană (chiar dacă el era atenian). Cercetările biomedicale, farmaceutice, biomecanice şi psihologice recente pun într-o lumină cu totul nouă sacrificiul atletului grec. În acest context, se încearcă o analiză succintă a principalelor caracteristici care definesc acum spiritul sportiv.

Sănătatea sportivului trebuie să fie perfectă, întrucât factorii de risc în timpul competiţiei sunt evident diferiţi de cei întâlniţi în situaţii obişnuite. O analiză riguroasă a maratonului londonez pentru perioada 1981-2004, corelată cu numărul de alergători (32 000), ne arată că au existat 8 decese. Unul datorat accidentului vascular cerebral (subarachnoid hemorrahage), 2 datorate cardiomiopatiei hipertrofice (hipertrophic cardiomyopathy) şi 5 datorate cardiopatiei ischemice (coronary heart disease) (Tunstall Pedoe, 2004). Decesele au survenit în timpul cursei, imediat după terminarea ei, respectiv în decursul a 24 de ore după alergare. Acelaşi autor, printr-un calcul normalizat în care intervine timpul şi distanţa faţă de numărul de participanţi, raportează riscul de deces la maratonul londonez, comparativ cu datele furnizate de Consiliului european al siguranţei călătoriilor, pe perioada 2001-2002. Doar accidentele de motocicletă (18) întrec pe cele datorate maratonului (12), comparativ cu accidentele de bicicletă (3), auto (1) avion (0,67) şi raliu (0,08), înregistrate în aceeaşi perioadă de timp. Datele sunt cu adevărat surprinzătoare, cu toate că studiul se referea la atleţi care depăşesc vârsta de 30 de ani.

Organismul uman este un sistem automat cu autoreglare. În condiţii de stres fizic şi psihic, avalanşa de informaţii pe calea de reacţie duce la o depăşire a nivelurilor critice de referinţă. Mecanismele răspunzătoare de homeostazie nu mai funcţionează optim.

În cazul alergătorilor de fond pe distanţe lungi, pot apărea daune fiziologice datorită schimbului de ioni Na, K, Mg, Ca, Cl, în condiţii de neechilibru la nivelul membranei celulare. În absenţa unui efort fizic intens, concentraţiile de ioni rămân practic la valori constante printr-un mecanism încă necunoscut, care joacă rolul unui potenţiostat biologic. Studiile teoretice electrochimice iniţiale publicate de Goldman (1943), Hodkin şi Katz (1949) au arătat că potenţialul de repaus al membranei biologice este determinat de concentraţiile diferite ale ionilor de Na, K, Cl, în cele două soluţii apoase separate de membrană. În teoria Planck se presupune o „difuziune constrânsă" prin interfaţa lichidă, concentraţiile ionice în fiecare secţiune a joncţiunii rămânând constante în timp (Sten-Knudsen, 2002).

Pe baza teoriei Planck a potenţialului de difuzie, utilizând ecuaţii integrale Volterra, Bonciocat şi Marian (2005) au calculat contribuţiile celor trei densităţi de curent la echilibru. Suma celor trei contribuţii furnizează expresia potenţialului de repaus, iar comparaţia cu formula Goldman-Hodkin-Katz ne arată în ce condiţii expresiile sunt identice.

Dar, toate modelele teoretice se referă numai la prime aproximaţii în condiţii de staţionaritate. Aspectele teoretice ale contribuţiilor tuturor ionilor, incluzând speciile radicale în mecanismele de schimb prin membrana celulară în condiţii de neechilibru, în prezenţa stimulenţilor şi efectele sinergice sau catalitice induse de oligoelemente, rămân pentru moment neelucidate.

Speciile radicale sau non-radicale derivate din oxigen sau azot, datorită afinităţii lor chimice faţă de molecule ţintă, sunt responsabile de deteriorări ale ţesutului celular ca urmare a modificării proteinelor, peroxidării lipidelor şi ruperii lanţului ADN. În timpul solicitării ciclice a ţesuturilor musculare şi tendoanelor, intervalul de efort maxim este asociat ischemiei şi, ca urmare, când se revine la oxigenarea normală a ţesutului, este stimulată producerea de specii radicale (Bestwick & Maffulli, 2004). Hipertermia furnizează radicali prin activarea proceselor combinate de transfer de sarcină şi difuzie, probabil la nivel mitocondrial. Mecanismul biochimic individual de adaptabilitate la generarea de radicali este pentru moment neclar, atât la o persoană obişnuită, cât şi la atleţii de

performanţă.

Caracterul şi educaţia sportivilor joacă un rol cheie în cadrul competiţional. Cu toate că există diferenţe de ordin educaţional în funcţie de apartenenţa la un anumit grup, în cadru instituţional regulile elementare de igienă şi comportament sunt respectate conform uzanţelor. Pe de altă parte, toleranţa religioasă este la rândul ei implicată în raporturile dintre oficiali şi sportivi. Cu alte cuvinte, xenofobia şi intoleranţa sunt excluse cu desăvârşire din competiţiile sportive. Orice sportiv care tinde spre titluri trebuie să posede un caracter puternic şi să accepte cu fair-play varianta înfrângerii. Fără un *respect de sine şi faţă de ceilalţi participanţi* nu se poate atinge excelenţa.

Dedicarea este un alt deziderat pentru un sportiv. Într-un editorial recent (Bocu, 2014), se atrage atenţia asupra fenomenului de adicţie, subliniind faptul că în cazul sportului de performanţă, efortul trebuie controlat de echipe medicale specializate. Acest fenomen de adicţie este şi mai nociv la sportivii care s-au retras din activitate, dar participă totuşi la competiţii (vezi maratonul). Fără supraveghere medicală, integral computerizată, organizatorii sunt în imposibilitatea de a-i urmări pe participanţi. Cauzele perpetuării adicţiei sunt multiple, dar două ies în evidenţă. Competiţia în sine nu presupune pentru moment monitorizarea complexă bioelectrochimică wireless şi costul echipamentelor este încă prohibitiv. Cu toate acestea, sportivii vârstnici sunt încurajaţi să participe la competiţii de maraton. Cazul bătrânului atlet (Fauja Singh) de 93 de ani care a terminat maratonul londonez în 2004, în 6 ore și 7 minute este de notorietate.

Solidaritatea în fata situaţiilor întâmplătoare cu consecinţe uneori tragice presupune oare întreruperea competiţiei respective ? E greu de crezut că după moartea unui coechipier, ţinând cont de *spiritul de echipă* ceilalţi colegi se mai pot mobiliza. Psihologii afirmă că tocmai atunci se manifestă curajul.

Curajul de a ataca limitele capacităţilor proprii și ale competitorilor este un alt factor determinant în promovarea spiritului sportiv.

Am lăsat la urmă unele aspecte controversate. Orice performer care respectă olimpismul tinde spre *excelenţă*. Pentru atingerea acestui deziderat, suntem oare (din păcate) condamnaţi la înşelăciune, se întreabau (Săvulescu et al., 2004) (Oxford University), într-un eseu cu trimitere la *etică, fair play şi onestitate*. Analiza se referă la interzicerea sau controlul administrării de compuşi chimici, de sinteză, naturali (ex. hormonul eritropoetină, EPO, stimulează producerea de hematii) şi a unor dispozitive hipoxidice, care dezvoltă mecanisme de reacţie biochimice proprii individului. Concluzia lasă să se întrevadă posibilitatea legalizării consumului de compuşi chimici, dar sub control strict, cu scopul protejării sportivului.

La final se pun câteva întrebări. Am creat jocurile paralimpice. Separăm specia umană pe criterii care ţin de genetică, accidentări sau bioinginerie ? Cât de performantă va deveni fiinţa vie asistată de bioservomecanisme, când o asemenea biomecanostructură este dirijată de creierul uman ? Viitorul îndepărtat ne va impune alte separări ? Cu siguranţă, şi mai există o certitudine, va apare o nouă legislaţie. Până la urmă rămâne *respectul faţă de reguli şi legi*. El întregeşte spiritul sportiv.

Bibliografie

Bestwick CS, Maffulli M. Reactive oxygen species and tendinopathy: do they matter ? Br. J. Sports Med. 2004; 38(4):672-674.

Bocu T. Moderate exercise vs. physical exercise addiction. Palestrica of the third millennium - Civilization and sport, 2014; 15(1):7-8.

Bonciocat N, Marian IO. A new approach to the rest potential of biological membrane. J. Pharm. Biomed. Analysis, 2005; 37(5):831-838.

Goldman DE. Potential, impedance and rectification in membranes. J. Gen. Physiol. 1943; 27(1):37-60.

Hodkin AL, Katz B. The effect of sodium ions on the electrical activity of the giant axon of squid. J. Physiol. 1949; 108(1):37-77.

Săvulescu J, Foddy B, Clayton M. Why we should allow performance enhancing drugs in sport. Br. J. Sports Med. 2004; 38(4):666-670.

Sten-Knudsen O. Biological membranes, Theory transport, potentials, and electric impulses. ch.3. Membrane potential, Cambridge University Press, 2002.

Tunstall Pedoe DS. Sudden death risk in older athlets: increasing the denominator. Br. J. Sports Med. 2004; 38(4):671-672.

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 183–188

ORIGINAL STUDIES
ARTICOLE ORIGINALE

Motor and emotional behaviour in experimentally induced schizophrenia

Comportamentul motor şi emoţional în schizofrenia indusă experimental

Mihnea C. Manea[1], Maria G. Puiu[1], Mirela Manea[1], Simona Tache[2]
[1]"Carol Davila" University of Medicine and Pharmacy, Bucharest
[2]"Iuliu Haţieganu" University of Medicine and Pharmacy, Cluj-Napoca

Abstract

Background. Schizophrenia is a serious psychiatric disorder with 0.5-1% prevalence worldwide. Administration of MK-801 and exposure to intermittent hypobaric hypoxia were experimentally used to establish schizophrenia models in rats.

Aims. We aimed to study experimentally in male and female rats the following: the postnatal induced schizophrenia model by MK-801 administration and intermittent hypobaric hypoxia exposure during postnatal days 7-21; the changes in motor and emotional behaviour in rats with schizophrenia, and the gender differences between male and female rats.

Methods. The research was performed in 6 groups of rats (n=10 animals/group) as follows: group I - male, control; group II - female, control; group III - male with schizophrenia induced by MK-801 administration; group IV - male with schizophrenia induced through intermittent hypobaric hypoxia exposure; group I - female with schizophrenia induced by MK-801 administration; group IV - female with schizophrenia induced through intermittent hypobaric hypoxia exposure. Involuntary motility and emotional behaviour were tested using the Open Field test. The examination moments were postnatal days 22 (T_0) and 49 (T_{28}).

Results. The Open Field test values - emotional score, evidenced very statistically significant differences between all groups (III-VI) with schizophrenia, compared to controls (I-II) at moment T_{28}. The Open Field test values - motility score, evidenced very statistically significant differences between all groups (III-VI) with schizophrenia, compared to controls (I-II) at moment T_{28}. The emotional score and the motility score showed statistically significant differences between the male and female group (III, V) in rats with schizophrenia induced by MK-801 administration, compared to initial values.

Conclusions. Emotional behaviour increases in male and female rats with schizophrenia, compared to controls. Involuntary motor behaviour decreases in male and female rats with schizophrenia, compared to controls. We did not observe a significant gender difference.

Keywords: schizophrenia, MK-801, hypobaric hypoxia, Open Field test.

Rezumat

Premize. Schizofrenia este o tulburare psihică gravă, cu o prevalenţă de 0,5-1% la nivel mondial. Administrarea de MK-801 şi expunerea la hipoxie hipobară intermitentă au fost utilizate pentru a induce modele experimentale de schizofrenie la şobolani.

Obiective. Ne-am propus să studiem experimental la şobolani masculi şi femele următoarele: modelul de schizofrenie indusă postnatal prin administrarea MK-801 şi expunerea intermitentă la hipoxie hipobară în zilele postnatale 7-21, schimbările comportamentului motor involuntar şi emoţional la şobolani cu schizofrenie şi diferenţele de gen între şobolanii masculi şi femele.

Metode. Studiul a fost efectuat pe 6 loturi de şobolani (n=10 animale/lot), după cum urmează: lotul I - masculi, control; lotul II - femele, control; lotul III - masculi, cu schizofrenie indusă prin administrarea MK-801; lotul IV - masculi, cu schizofrenie indusă prin expunerea intermitentă la hipoxie hipobară; lotul V - femele, cu schizofrenie indusă prin administrarea MK-801; lotul VI - femele, cu schizofrenie indusă prin expunerea intermitentă la hipoxie hipobară. Motilitatea involuntară şi comportamentul emoţional au fost testate cu ajutorul testului Open Field. Momentele pentru examinare au fost zilele postnatale 22 (T_0) şi 49 (T_{28}).

Rezultate. Valorile testului Open Field pentru scorul emoţional arată diferenţe înalt semnificative statistic între toate loturile (III-VI) cu schizofrenie, comparativ cu martorii (I-II), la momentul T_{28}. Valorile testului Open Field pentru scorul de motilitate arată diferenţe înalt semnificative statistic între toate loturile (III-VI) cu schizofrenie, comparativ cu martorii (I-II), la momentul T_{28}. Privind scorul emoţional şi scorul de motilitate, au fost observate diferenţe înalt semnificative statistic între loturile de masculi şi femele (III, V) la şobolanii cu schizofrenie indusă prin administrarea MK-801, comparativ cu valorile iniţiale.

Concluzii. Comportamentul emoţional creşte la şobolanii masculi şi femele cu schizofrenie, comparativ cu martorii. Comportament motor involuntar scade la şobolanii masculi şi femele cu schizofrenie, comparativ cu martorii. Nu am observat o diferenţă semnificativă între masculi şi femele.

Cuvinte cheie: schizofrenie, MK-801, hipoxie hipobară, testul Open Field.

Received: 2014, August 16; *Accepted for publication:* 2014, September 16;
Address for correspondence: "Carol Davila" University of Medicine and Pharmacy Bucharest, No.8 Eroilor Sanitari Street
E-mail: mihnea.manea@live.com

Introduction

Schizophrenia is a serious psychiatric disorder with 0.5-1% prevalence worldwide (Jablenski, 2000; McGrath et al., 2008). A large number of different animal models for the study of schizophrenia have been described. The administration of MK-801 and the exposure to intermittent hypobaric hypoxia have been experimentally used as schizophrenia models in experimental animals.

MK-801 (dizolcipine) induced in rat a pharmacological model of schizophrenia aspects, based on the N-methyl-D-aspartic acid (NMDA) receptor antagonist, which is known to produce many positive and negative cognitive symptoms of schizophrenia (Kesby et al., 2006; Ozyurt et al., 2007; Gururajan et al., 2011; Wedzony et al., 2008).

Hypoxia represents a factor of obstetric complications in the pathophysiology of schizophrenia. Hypobaric hypoxia is an environmental factor that requires a complex neuroendocrine response with adaptive specific changes involving the circulatory, respiratory, metabolic, enzymatic systems (Cârmaciu, 1996, Tache, Artino, 1996; Guyton, Hall, 1996). The exposure to chronic and intermittent pre-, peri- and postnatal short-term hypobaric hypoxia induced several effects in the neurodevelopmental mechanisms of schizophrenia. Hypobaric hypoxia represents a biophysical model of schizophrenia aspects in rats (Boksa et al., 2006; Schmidt-Kastner et al., 2006; Tiul'kova et al., 2010; Graf et al., 2005).

According to the neurodegenerative pathogenesis theory of schizophrenia, this occurs as a result of a process of chronic progressive degeneration of the brain neurons (dopaminergic and glutamatergic neurons), which could be prevented by treatment with neuroleptics (Stahl, 2002).

In schizophrenia, there are clear differences in gender, in the incidence of complications at birth, age of onset and the presence or extension of brain abnormalities (Leung, Chue, 2000).

Objectives

We aimed to experimentally study in male and female rats the following: a) the postnatally induced schizophrenia model by MK-801 administration and intermittent hypobaric hypoxia exposure during postnatal days 7-21, b) the changes in motor and emotional behaviour in rats with schizophrenia, and c) the gender differences between male and female rats.

Hypothesis

Changes of locomotor and emotional behaviour have been studied particularly in animals with schizophrenia models induced by postnatal MK-801 administration or through exposure to hypobaric hypoxia (Vázquez-Roque et al., 2012; Hains et al., 2009; Pietraszek et al., 2009).

Materials and methods

Research protocol

a) *Period and place of the research*

Male and female albino Wistar rats, weighing 130-150 g, obtained from the Biobase of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca were used in this study. The study was carried out in the Experimental Research Laboratory of the Department of Physiology, with the approval of the Bioethics Board.

Before any experiment, all animals were kept for 1 week in the experimental laboratory of the Physiology department, under the same laboratory conditions of temperature (22±2ºC), relative humidity (70±4%), in a 12 h light/dark cycle. They received a nutritionally standard diet (combined grain feed, Cantacuzino Institute, Bucharest); water *ad libitum*.

All procedures were carried out with the approval of the local animal use committee of the "Iuliu Haţieganu" University of Medicine and Pharmacy and were in accordance with Directive 86/609/EEC of 24 November 1986 regarding the protection of animals used for experimental and scientific purposes.

b) *Subjects and groups*

The selected animals were postnatally exposed, between days 7-21, to MK-801 and hypobaric hypoxic stress, according to the animal model of schizophrenia in rats.

The animals were randomly divided into 6 groups of 10 rats/group: I – male control group; II – female control group; III – male schizophrenic group (MK-801 administration); IV – male schizophrenic group (exposure to hypobaric hypoxia); V – female schizophrenic group (MK-801 administration); VI – female schizophrenic group (exposure to hypobaric hypoxia).

MK-801 (dizocilpine) was given intraperitoneally at a dose of 0.3 mg/kg, 4 doses, on days 7, 12, 16, 21, during 14 days (days 7-21).

Exposure to hypobaric hypoxia – 349 mmHg, air pO_2 = 75 mm Hg, arterial blood pO_2 = 71% O_2 (corresponding to 6000 m altitude) was performed in a barometric chamber at the experimental laboratory of the Physiology Department, for 14 days (days 7-21), 2 h/day.

c) *Tests applied*

Involuntary motility was tested using the open field test (OFT), according to Denenberg & Whimby (1963). The monitored indicators were emotivity and motility. Emotivity was calculated based on the emotional score (ES): the sum of micturitions and defecations expressed in absolute values. The increase of their number is considered an indicator of anxiety. Spontaneous motility was calculated based on the motility score (MS): the sum of crossings and rearings. The increase of motility is and indicator of the absence of anxiety.

The examination moments were postnatal days 22 (T_0) and 49 (T_{28}).

At the end of the experiment, the animals were euthanized with ketamine in a dose of 0.2 ml/100 g animal.

d) *Statistical analysis*

Statistical processing was performed using the Excel application (Microsoft Office 2007) and the StatsDirect v.2.7.2. program. Statistical comparisons between the groups were done by the Student t test. Significance was accepted at the level of $p<0.05$.

Results

a) *Analysis by moments*

The statistical analysis of the open field test values - emotional score (Table I) - showed the following:

Table I

Comparative analysis for open field test values and statistical significance.

Group	OPEN FIELD Test		Mean	SE	Median	SD	Min.	Max.
I	Emotional score	T_0	5.6	0.4761	5.5	1.5055	3	8
		T_{28}						
	Motility score	T_0	24.5	0.5821	24	1.8409	21	27
		T_{28}						
II	Emotional score	T_0	6	0.3944	5.5	1.2472	5	8
		T_{28}						
	Motility score	T_0	28.7	0.9315	28	2.9458	25	34
		T_{28}						
III	Emotional score	T_0	11.6	0.4	12	1.2649	10	13
		T_{28}	10.9	0.3480	11	1.1005	9	12
	Motility score	T_0	8.1	0.2769	8	0.8756	6	9
		T_{28}	9.8	0.4422	9.5	1.3984	8	12
IV	Emotional score	T_0	9	0.4216	9	1.3333	7	11
		T_{28}	9.6	0.4	9.5	1.2649	8	12
	Motility score	T_0	11.9	0.5044	11.5	1.5951	9	14
		T_{28}	12.3	0.3667	12.5	1.1595	10	14
V	Emotional score	T_0	11.4	0.5416	11	1.7127	9	15
		T_{28}	7.6	0.5416	7.5	1.7127	5	10
	Motility score	T_0	11.2	0.1333	11	0.4216	11	12
		T_{28}	13.8	0.5538	14	1.7512	11	16
VI	Emotional score	T_0	8.8	0.3266	9	1.0328	7	10
		T_{28}	7.4	0.3055	7	0.9661	6	9
	Motility score	T_0	12.6	0.3712	13	1.1738	10	14
		T_{28}	13	0.6146	13.5	1.9437	10	16

Statistical significance (p) – unpaired samples

Group	Emotional score T_0	Emotional score T_{28}
I-II	0.6354	
I-III	< 0.0001	< 0.0001
I-IV	0.0001	< 0.0001
III-IV	0.001	0.03
II-V	< 0.0001	0.034
II-VI	0.0002	0.0217
V-VI	0.0005	0.8236
III-V	0.6044	0.0002
IV-VI	> 0.9999	0.0006

Group	Motility score T_0	Motility score T_{28}
I-II	0.0008	
I-III	< 0.0001	< 0.0001
I-IV	< 0.0001	< 0.0001
III-IV	< 0.0001	0.0007
II-V	< 0.0001	< 0.0001
II-VI	< 0.0001	< 0.0001
V-VI	0.007	0.3603
III-V	< 0.0001	0.0001
IV-VI	0.3688	0.3581

Statistical significance (p) – Paired samples

Emotional score		Motility score	
I: –	IV: 0.3125	I: –	IV: 0.7344
II: –	V: 0.002	II: –	V: 0.0039
III: 0.2031	VI: 0.0234	III: 0.0078	VI: 0.7422

• taking into account the 6 studied groups of rats

- at moment T_0 - highly statistically significant differences between at least two groups ($p<0.0001$)

- at moment T_{28} - highly statistically significant differences between at least two groups ($p<0.0001$)

• taking into account the 3 studied groups of male rats

- at moment T_0 - highly statistically significant differences between at least two groups ($p<0.0001$)

- at moment T_{28} - highly statistically significant differences between at least two groups ($p<0.0001$)

• taking into account the 3 studied groups of female rats

- at moment T_0 - highly statistically significant differences between at least two groups ($p<0.0001$)

- at moment T_{28} - statistically significant differences between at least two groups ($p=0.035$).

The statistical analysis of the open field test values - motility score - evidenced the following:

• taking into account the 6 studied groups of rats

- at moment T_0 - highly statistically significant differences between at least two groups ($p<0.0001$)

- at moment T_{28} - highly statistically significant differences between at least two groups ($p<0.0001$)

• taking into account the 3 studied groups of male rats

- at moment T_0 - highly statistically significant differences between at least two groups ($p<0.0001$)

- at moment T_{28} - highly statistically significant differences between at least two groups ($p<0.0001$)

• taking into account the 3 studied groups of female rats

- at moment T_0 - highly statistically significant differences between at least two groups ($p<0.0001$)

- at moment T_{28} - highly statistically significant differences between at least two groups ($p<0.0001$).

b) *Analysis by groups*

The statistical analysis of the open field test values for unpaired samples showed the following:

• emotional score

- at moment T_0 - highly statistically significant differences between groups I-III, I-IV, II-V, II-VI and V-VI ($p<0.001$) and highly statistically significant differences between groups III and IV ($p<0.01$)

- at moment T_{28} - highly statistically significant differences between groups I-III and I-IV ($p<0.001$) and statistically significant differences between groups III-IV, II-V and II-VI ($p<0.05$)

• motility score

- at moment T_0 - highly statistically significant differences between groups I-II, I-III, I-IV, III-IV, II-V and II-VI ($p<0.001$) and highly statistically significant differences between groups V-VI ($p<0.01$)

- at moment T_{28} - highly statistically significant differences between groups I-III, I-IV, III-IV, II-V and II-VI ($p<0.001$).

The statistical analysis of the open field test values for paired samples (T_0-T_{28}) evidenced the following:

• emotional score - highly statistically significant differences for group V ($p<0.01$) and statistically significant differences for group VI ($p<0.05$)

• motility score - highly statistically significant differences for groups III and V ($p<0.01$).

c) *Correlation analysis of scores by groups and moments*

For group I, the statistical correlation analysis between the values of the studied indicators showed (Table II):

- at moment T_0 - a weak/null correlation between the emotional score and the motility score.

For group II, the statistical correlation analysis between the values of the studied indicators showed:

- at moment T_0 - a good positive correlation between the emotional score and the motility score.

For group III, the statistical correlation analysis between the values of the studied indicators showed:

- at moment T_0 - a weak/null correlation between the emotional score and the motility score

- at moment T_{28} - a weak/null correlation between the emotional score and the motility score.

For group IV, the statistical correlation analysis between the values of the studied indicators showed:

- at moment T_0 - *an acceptable negative correlation* between the emotional score and the motility score

- at moment T_{28} - a good positive correlation between the emotional score and the motility score.

For group V, the statistical correlation analysis between the values of the studied indicators showed:

- at moment T_0 - a weak/null correlation between the emotional score and the motility score

- at moment T_{28} - a weak/null correlation between the emotional score and the motility score.

For group VI, the statistical correlation analysis between the values of the studied indicators showed:

- at moment T_0 - a weak/null correlation between the emotional score and the motility score

- at moment T_{28} - an acceptable positive correlation between the emotional score and the motility score.

Table II

Statistical correlation analysis between the open field test scores in the six groups.

Group	**Moment**	Emotional score – motility score	
I	T_0	-0.0064	*
II	T_0	0.5024	***
III	T_0	0.0072	*
	T_{28}	-0.0880	*
IV	T_0	-0.4304	**
	T_{28}	0.5343	***
V	T_0	-0.0887	*
	T_{28}	-0.1615	*
VI	T_0	0.0000	*
	T_{28}	0.4838	**

Discussions

The emotional score

Our results show significant increases of the emotional score at 28 days in the groups of males (group III) and females (group V) with schizophrenia induced by MK-801 and hypobaric hypoxia (groups IV, VI), compared to control animals (groups I and II).

At 28 days, in male animals in which schizophrenia was induced by hypoxia (group IV), there were significant decreases of the emotional score compared to male animals in which schizophrenia was induced by the administration of MK-801 (group III).

Compared to initial values, in female animals with induced schizophrenia (groups V and VI), there were significant decreases of the emotional score at 28 days.

At 28 days, in male animals with induced schizophrenia (groups III, IV), there were significant increases of the emotional score compared to female animals with schizophrenia induced by the same method (groups V and VI).

The induction of schizophrenia by MK-801 administration in male animals (group III) caused significant increases of the emotional score compared to female animals (group V) in which schizophrenia was induced by the same methods.

The motility score

In female control animals (group II), there were significant increases in the motility score at 28 days compared to male control animals (group I).

The motility score at 28 days presented significant decreases in male and female animals with schizophrenia induced by MK-801 administration (groups III, V) and hypobaric hypoxia (groups IV, VI) compared to the control animals (groups I-II).

At 28 days, in male animals in which schizophrenia was induced by hypoxia (group IV), there were significant increases in the motility score compared to male animals in which schizophrenia was induced by MK-801 administration (group III).

The correlation analysis between the emotional score and the motility score at 28 days showed a good positive correlation for the group of female control animals and the group of males with schizophrenia induced by hypobaric hypoxia.

Compared to initial values, in female animals with schizophrenia induced by MK-801 administration (group V) and in male animals in which schizophrenia was induced by the same procedure (group III), significant increases in the motility score occurred.

At 28 days, in male animals in which schizophrenia was induced by MK-801 administration (group III), there were significant decreases in the motility score compared to female animals with schizophrenia induced by the same method (group V).

Our results regarding the model of schizophrenia induced by subchronic postnatal MK-801 administration are consistent with data from other authors regarding the effects of MK-801 administration to increase anxiety and emotional reactions, to decrease motility and exploratory behaviour and to influence memory and the learning ability (Akillioglu et al., 2012; Kubík et al., 2014; Lobellova et al., 2013; Vales et al., 2006; Li et al, 2011).

The experiments showed that MK801 was more effective in stimulating ataxia and locomotion and inhibiting stationary behaviour in female animals, while in male animals it stimulated stereotyping and thigmotaxis and inhibited rearing and grooming movements (Feinstein, Kritzer, 2013).

The effects of MK-801 on behaviour are dependent on the temporal profile, the administered dose, the number of daily injections (acute, subacute, and chronic), the age and sex of experimental animals. Female rats expressed 4-10 times more behavioural changes induced by MK-801 and presented about 25 times higher concentrations of MK-801 in the serum and brain than male rats (Andiné et al., 1999). Other studies suggest that MK-801-induced effects are more reproducible in female animals (Farber, 2003; Dickerson, Sharp, 2006; Nakki et al., 1996). Low doses result in increased concentrations of MK-801 in the frontal and parietal cortex, hypothalamus, striatum and hippocampus of male and female animals (Feinstein, Kritzer, 2013).

Hypobaric hypoxia is classified as histotoxic hypoxia (Cârmaciu, 1996, Tache, Artino, 1996; Guyton, Hall, 1996). Our data regarding the use of intermittent hypobaric hypoxia for the induction of schizophrenia in rats show similar changes in anxiety, emotivity, motility to those induced in the model of schizophrenia by the administration of MK-801, compared to controls.

Postnatal exposure to intermittent hypobaric hypoxia to induce schizophrenia in rats has been relatively little used experimentally (Samoilov et al., 2014; Rybnikova et al., 2008, 2009, 2012; Langmeier, Maresová, 2005; Lima-Ojeda et al., 2014; Schaeffer et al., 2013).

Our experimental results show that the models we used are valid neurobiological models for inducing postnatal schizophrenia in rats and for observing its manifestations on postnatal day 49, at the postpubertal age of 8 weeks (adolescents) (1).

The postnatal induction of schizophrenia on days 7-21 was followed by significant behavioural changes compared to controls, which occurred from day 22 (moment T_0). On day 49 (moment T_{28}), the changes were significant compared to values at 22 days.

Conclusions

1. Anxiety and emotivity increased significantly in male and female animals with induced schizophrenia compared to controls; spontaneous motility decreased significantly in male and female animals with induced schizophrenia compared to controls.

2. Locomotor activity decreased significantly in animals with induced schizophrenia, the most significant decreases being found in male animals with schizophrenia induced by hypoxia.

3. The models of schizophrenia experimentally induced by subchronic MK-801 administration and exposure to moderate intermittent hypobaric hypoxia are valid and original models.

Conflicts of interests

There are no conflicts of interest.

Acknowledgments

This paper is based on research data for the first author's doctoral thesis.

References

Akillioglu K, Babar Melik E, Melik E, Kocahan S. The investigation of neonatal MK-801 administration and physical environmental enrichment on emotional and cognitive functions in adult Balb/c mice. Pharmacol Biochem Behav, 2012; 102(3):407-414.

Andiné P, Widermark N, Axelsson R, Nyberg G, Olofsson U, Mårtensson E, Sandberg M. Characterization of MK-801-induced behaviour as a putative rat model of psychosis. J Pharmacol Exp Ther, 1999; 290(3):1393-1408.

Boksa P, Zhang Y, Amritraj A, Kar S. Birth insults involving hypoxia produce long-term increases in hippocampal [125I] insulin-like growth factor-I and -II receptor binding in the rat. Neuroscience. 2006; 139(2):451-462.

Cârmaciu R (sub red.). Guyton. Fiziologie. Ed. a 5-a, Editura Medicală Amalteea, WB Saunders, Bucureşti, 1996; VIII/30:290-294, XIV/57:577-583.

Denenberg VH, Whimby AE. Behaviour of adult rats is modified by the experiences their mothers had as infants. Science. 1963; 142:1192-1193.

Dickerson J, Sharp FR. Atypical antipsychotics and a Src kinase inhibitor (PP1) prevent cortical injury produced by the psychomimetic, noncompetitive NMDA receptor antagonist MK-801. Neuropsychopharmacol. 2006; 31:1420–1430.

Farber NB. The NMDA receptor hypofunction model of psychosis. Annals NY Acad Sci, 2003; 1003: 119–130.

Feinstein I, Kritzer MF. Acute N-methyl-D-aspartate receptor hypofunction induced by MK801 evokes sex-specific changes in behaviours observed in open-field testing in adult male and proestrus female rats. Neuroscience, 2013; 228:200-214.

Graf AV, Maslova MV, Maklakova AS, Sokolova NA, Goncharenko EN, Baĭzhumanov AA, Krushinskaia IaV. Acute antenatal hypoxia on different stages of embryogenesis changes the offspring behaviour patterns and biogenic amine levels. Ross Fiziol Zh Im I M Sechenova, 2005; 91(2):152-157.

Gururajan A, Taylor DA, Malone DT. Effect of cannabidiol in a MK-801-rodent model of aspects of schizophrenia. Behav Brain Res, 2011; 222(2):299-308.

Guyton AC, Hall JE. Textbook of Medical Physiology. 9th ed., Saunders & Comp., Philadelphia, 1996; VII/4:52, VIII/43:549-552

Hains AB, Vu MA, Maciejewski PK, van Dyck CH, Gottron M, Arnsten AF. Inhibition of protein kinase C signaling protects prefrontal cortex dendritic spines and cognition from the effects of chronic stress. Proc Natl Acad Sci USA, 2009; 106(42):17957-17962.

Jablensky A. Epidemiology of schizophrenia: the global burden of disease and disability. Eur Arch Psychiatry Clin Neurosci, 2000; 250(6):274-285.

Kesby JP, Burne TH, McGrath JJ, Eyles DW. Developmental vitamin D deficiency alters MK 801-induced hyperlocomotion in the adult rat: An animal model of schizophrenia. Biol Psychiatry, 2006; 60(6):591-596.

Kubík S, Buchtová H, Valeš K, Stuchlík A. MK-801 Impairs Cognitive Coordination on a Rotating Arena (Carousel) and Contextual Specificity of Hippocampal Immediate-Early Gene Expression in a Rat Model of Psychosis. Front Behav Neurosci, 2014; 8:75.

Langmeier M, Maresová D. Intermittent hypobaric hypoxia during development - morphological and functional changes in the neocortex. Prague Med Rep. 2005; 106(3):275-282.

Leung A, Chue P. Sex differences in schizophrenia, a review of the literature. Acta Psychiatr Scand Suppl. 2000; 401:3–38.

Li JT, Su YA, Guo CM, Feng Y, Yang Y, Huang RH, Si TM. Persisting cognitive deficits induced by low-dose, subchronic treatment with MK-801 in adolescent rats. Eur J Pharmacol, 2011; 652(1-3):65-72.

Lima-Ojeda JM, Vogt MA, Richter SH, Dormann C, Schneider M, Gass P, Inta D. Lack of protracted behavioural abnormalities following intermittent or continuous chronic mild hypoxia in perinatal C57BL/6 mice. Neurosci Lett, 2014; 577C:77-82.

Lobellova V, Entlerova M, Svojanovska B, Hatalova H, Prokopova I, Petrasek T, Vales K, Kubik S, Fajnerova I, Stuchlik A. Two learning tasks provide evidence for disrupted behavioural flexibility in an animal model of schizophrenia-like behaviour induced by acute MK-801: a dose-response study. Behav Brain Res, 2013; 246:55-62.

McGrath J, Saha S, Chant D, Welham J. Schizophrenia: a concise overview of incidence, prevalence, and mortality. Epidemiol. Rev. 2008; 30, 67–76.

Nakki R, Sharp FR, Sagar SM, Honkaniemi J. Effects of phencyclidine on immediate early gene expression in the brain. J Neurosci Res. 1996; 45:13–27.

Ozyurt B, Sarsilmaz M, Akpolat N, Ozyurt H, Akyol O, Herken H, Kus I. The protective effects of omega-3 fatty acids against MK-801-induced neurotoxicity in prefrontal cortex of rat. Neurochem Int. 2007c; 50(1):196-202.

Pietraszek M, Michaluk J, Romańska I, Wasik A, Gołembiowska K, Antkiewicz-Michaluk L. 1-Methyl-1,2,3,4-tetrahydroiso-

quinoline antagonizes a rise in brain dopamine metabolism, glutamate release in frontal cortex and locomotor hyperactivity produced by MK-801 but not the disruptions of prepulse inhibition, and impairment of working memory in rat. Neurotox Res, 2009; 16(4):390-407

Rybnikova E, Gluschenko T, Tulkova E, Churilova A, Jaroshevich O, Baranova K, Samoilov M. Preconditioning induces prolonged expression of transcription factors pCREB and NF-kappa B in the neocortex of rats before and following severe hypobaric hypoxia. J Neurochem, 2008; 106(3):1450-1458.

Rybnikova E, Glushchenko T, Tyulkova E, Baranova K, Samoilov M. Mild hypobaric hypoxia preconditioning up-regulates expression of transcription factors c-Fos and NGFI-A in rat neocortex and hippocampus. Neurosci Res, 2009; 65(4):360-366.

Rybnikova E, Vorobyev M, Pivina S, Samoilov M. Postconditioning by mild hypoxic exposures reduces rat brain injury caused by severe hypoxia. Neurosci Lett, 2012; 513(1):100-105.

Samoilov M, Churilova A, Gluschenko T, Rybnikova E. Neocortical pCREB and BDNF expression under different modes of hypobaric hypoxia: Role in brain hypoxic tolerance in rats. Acta Histochem. 2014 Apr 17. pii: S0065-1281(14)00056-7.

Schaeffer EL, Kühn F, Schmitt A, Gattaz WF, Gruber O, Schneider-Axmann T, Falkai P, Schmitt A. Increased cell proliferation in the rat anterior cingulate cortex following neonatal hypoxia: relevance to schizophrenia. J Neural Transm, 2013; 120(1):187-195.

Schmidt-Kastner R, van Os J, W M Steinbusch H, Schmitz C. Gene regulation by hypoxia and the neurodevelopmental origin of schizophrenia. Schizophr Res. 2006; 84(2-3):253-271.

Stahl MS. Psychopharmacologie essentielle. Trad. Thierry Faivre et Patrick Leoine, Med. Sci, Paris, 2002; 368-370

Tache S, Artino MG. Fiziologia aparatului respirator. Ed. Dacia, Cluj-Napoca, 1996; XIV:243-255, XVIB:268-279.

Tiul'kova EI, Vataeva LA, Samoĭlov MO. Effect of prenatal hypobaric hypoxia on activity of the rat brain phosphoinositide system. Zh Evol Biokhim Fiziol. 2010; 46(5):406-410.

Vales K, Bubenikova-Valesova V, Klement D, Stuchlik A. Analysis of sensitivity to MK-801 treatment in a novel active allothetic place avoidance task and in the working memory version of the Morris water maze reveals differences between Long-Evans and Wistar rats. Neurosci Res, 2006; 55(4):383-388.

Vázquez-Roque RA, Ramos B, Tecuatl C, Juárez I, Adame A, de la Cruz F, Zamudio S, Mena R, Rockenstein E, Masliah E, Flores G. Chronic administration of the neurotrophic agent cerebrolysin ameliorates the behavioural and morphological changes induced by neonatal ventral hippocampus lesion in a rat model of schizophrenia. J Neurosci Res, 2012; 90(1):288-306.

Wedzony K, Fijal K, Mackowiak M, Chocyk A, Zajaczkowski W. Impact of postnatal blockade of N-methyl-D-aspartate receptors on rat behaviour: a search for a new developmental model of schizophrenia. Neuroscience, 2008; 153(4):1370-1379.

Web sites

(1) www.ratbehaviour.org, accessed on August 2014

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 189–192

Coenzyme Q10 action on mental fatigue and energy, in acute physical stress

Acţiunea Coenzimei Q10 asupra oboselii şi energiei mentale, în stresul fizic acut

Ramona Jurcău[1], Ioana Jurcău[2]
[1] *"Iuliu Haţieganu" University of Medicine and Pharmacy, Cluj-Napoca*
[2] *Pediatric Clinical Hospital, Cluj-Napoca*

Abstract

Background. Coenzyme Q10 (CQ10) is essential for the production of body energy and for the functioning of organs, including the brain.

Aims. The objective was to highlight the influence of CQ10 on the mental fatigue (MF) sensation and on mental energy (ME), in acute physical exercise.

Methods. Untrained volunteer subjects (n=12 men) were subjected to the following protocol: a) the physical stress period (P1): for a week, daily physical exercises consisted of running on a treadmill, for 12 min; b) the treatment period (P2): 21 days of CQ10 administration, under conditions of physical rest; c) the physical stress period (P3): repeating P1. MF and ME were assessed at the following moments: T1 = at the beginning of P1; T2 = at the end of P1; T3 = at the beginning of P3; T4 = at the end of P3. MF and ME were analyzed using Mental Energy and Mental Fatigue Scales. Statistical evaluation was made on the basis of the Student test.

Results. At T2 compared to T1: MF was significantly increased - MF (p=0.005) and ME was significantly diminished (p=0.003). At T4, compared to T2: MF was significantly diminished (p=0.03) and ME was significantly increased (p=0.01). There were no significant differences between: T1-T3, T1-T4.

Conclusions. 1) Under CQ10 influence, MF and ME were significantly modified. 2) CQ10 acted efficiently both on MF and ME. 3) CQ10 efficiency was evidenced in post-exercise stress, at T4. 4) We consider that CQ10 may be useful in modulating MF and ME in acute exercise stress.

Keywords: coenzyme Q10, physical stress, mental fatigue, mental energy.

Rezumat

Introducere. Coenzima Q10 (CQ10) este esenţială în producerea energiei corpului şi pentru funcţionarea organelor, inclusiv a creierului.

Obiective. Obiectivul studiului a fost de a evidenţia influenţa CQ10 asupra senzaţiei de oboseală mentală (OM) şi a energiei mentale (EM), în efortul fizic acut.

Metode. Subiecţii voluntari sedentari aleşi (n=12 bărbaţi) au fost supuşi următorului protocol: a) perioada de stres fizic (P1): o săptămână, zilnic, exerciţii fizice, constând în alergarea pe o bandă rulantă, timp de 12 min; b) perioada de tratament (P2): 21 zile de administrare a CQ10, în condiţii de repaus fizic; c) perioada de stres fizic (P3): reluarea programului T1. OM şi EM au fost evaluate la: T1 = înaintea începerii P1; T2 = la sfârşitul P1; T3 = la începutul P3; T4 = la sfârşitul P3. Au fost evaluate OM şi EM, utilizând Scalele de Oboseală Mentală şi Energie Mentală. Evaluarea statistică s-a făcut pe baza testului Student.

Rezultate. La T2 faţă de T1: OM a fost semnificativ crescută (p=0,005), iar EM (p=0,003) a fost semnificativ scăzută. La T4, faţă de T2: OM a fost semnificativ scăzută (p=0,03), iar EM (p=0,01) a fost semnificativ crescută. Nu au existat diferenţe semnificative între: T1-T3, T1-T4.

Concluzii. 1) Sub influenţa CQ10, OM şi EM au fost semnificativ modificate. 2) CQ10 a acţionat eficient, atât asupra OM, cât şi asupra EM. 3) Eficienţa CQ10 a fost remarcată în perioada post-stres, la T4. 4) Considerăm că CQ10 poate fi utilă în modularea OM şi EM, în stresul de efort fizic acut.

Cuvinte cheie: coenzima Q10, stres fizic, oboseală mentală, energie mentală.

Received: 2014, July, 20; *Accepted for publication:* 2014, September 24;
Address for correspondence: "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca 400012, Victor Babes Str. no. 8
E-mail: ramona_mj@yahoo.com

Introduction

Fatigue can be classified as physical or mental (Ishii et al., 2014a) and is defined as a decline in the ability and efficiency of mental and/or physical activities that is caused by excessive mental and/or physical activities. Several studies have identified brain regions in which the level of neural activities is correlated with the subjective level of fatigue (Ishii et al., 2014b).

Ubiquinone, also called Coenzyme Q (CoQ10), is a lipid subject to oxido-reduction cycles (Aussel et al., 2014), which shows an antifatigue effect and has been widely used by athletes to increase physical strength (Maruoka et al., 2014).

The present article continues the authors' previous research concerning the assessment of the relationship between physical effort and various natural products, through personal studies (Jurcău et al., 2013; Jurcău & Jurcău, 2013).

Hypothesis

The use of CoQ10 in exercise and health is a growing issue in practice and research. However, the CoQ10 influence on the sensation of tiredness and mental energy in acute physical exercise has been less explored.

Objectives

We propose the evaluation of the influence of a preparation containing CoQ10 on the mental fatigue (MF) and mental energy (ME) sensation, in acute physical exercise.

Material and methods

Research protocol

a) *Period and place of the research*

The study was approved by the Ethics Commission of the College of Physicians, and measurements were carried out in May 2013, in the Medical Family Office 122 in Cluj-Napoca. The participation of all subjects in the study was voluntary.

b) *Subjects and groups*

The selected subjects were sedentary. Persons with mental disorders, cortisone therapies of any kind and toxic addiction - alcohol, tobacco, drugs, coffee were excluded from the trials.

One group of 12 male subjects, with a mean age of 24.2 ± 4, was evaluated, being subjected to three successive assessment periods.

The participants were asked not to consume alcohol, coffee, not to smoke and not to use any medication or antioxidant the day before and during physical exercise.

c) *Tests applied*

- *Study design*

For stress caused by physical exercise, the model was an intense exercise of running on a treadmill. The protocol was the following: 1) the physical stress period = P1: for a week, daily running on a treadmill Excite + MD Run, for 12 min, at 30 Watt; 2) the treatment period = P2: 21 days of CQ10, under conditions of physical rest; 3) the physical stress period = P3: resuming the P1 programme.

The administered preparation was „CoQ10 Forte", produced by Dacia Plant company, Brașov (1). It was administered daily for three weeks, in a dose of 3 tablets per day at 7.00-13.00-19.00 during P2.

- *The indicators were determined* as follows:

time 1 = first determination, basal (T1) - at the beginning of P1;

time 2 = second determination (T2) - at the end of P1;

time 3 = third determination (T3) - at the beginning of P3;

time 4 = fourth determination (T4) - at the end of P3.

- *Explorations*

The measurements consisted of measuring mental fatigue and mental energy, with the Mental Fatigue and Mental Energy Scale, based on instructions such as „How do you feel now," each scale ranging from 0 to 300 mm; 300 represented the highest degree of mental energy/fatigue.

d) *Statistical processing*

- the results obtained were analyzed using the SPSS 13.0. statistical package.

- for continuous data examination, Student's t test was used.

- the differences were considered significant at a $p< 0.05$.

Results

Note that the *reference time* was considered to be T_1.

a) *Mental fatigue (MF)* (Fig. 1).

At T2 compared to T1, MF was significantly increased: p=0.005. At T4, compared to T2, MF was significantly decreased: p=0.03. There were no significant differences between T1-T3, T1-T4.

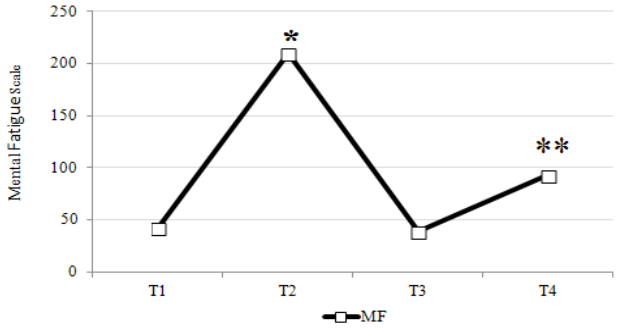


Fig. 1 - Changes of mental fatigue, in physical exercise. *p<0.005, **p<0.03, *=T_2-T_1, **=T_4-T_2

b) Mental energy (ME) (Fig. 1).

At T2 compared to T1, ME was significantly decreased: p=0.005. At T4, compared to T2, MF was significantly increased: p=0.03. There were no significant differences between T1-T3, T1-T4.

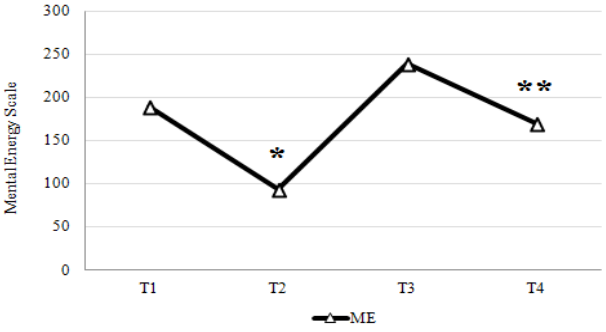


Fig. 2 - Changes of mental energy in physical exercise. *p<0.003, **p<0.01, *=T_2-T_1, **=T_4-T_2

c) Comparison of the pre-CoQ10 therapy *evolution of the analyzed parameters* (Fig. 3).

Physical exercise intensified MF (T2/T1 = 5.1), then lowered ME (T1/T2 = 2.04).

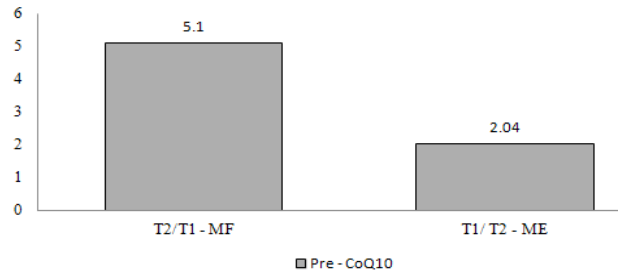


Fig. 3 - Comparison of the pre-CoQ10 therapy evolution of the analyzed parameters.

d) Comparison of the post-CoQ10 therapy *evolution of the analyzed parameters* (Fig. 4).

After CoQ10 therapy, the impact of exercise was greatly reduced compared to pre-CoQ10 therapy both on MF (T4/T3 = 2.4, versus T2/T1 = 5.1) and on ME (T3/T4 = 1.41, versus T1/T2 = 2.04).

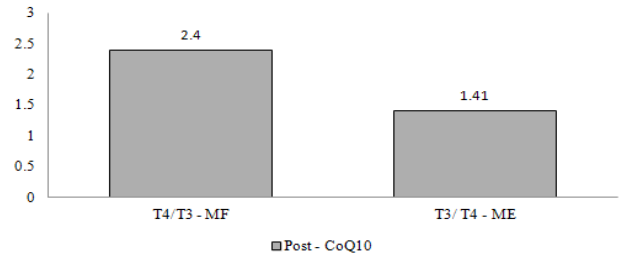


Fig. 4 - Comparison of the post-CoQ10 therapy evolution of the analyzed parameters.

Discussion

CoQ10

CoQ10 functions in the respiratory electron transport chain and plays a pivotal role in energy generating processes (Aussel et al., 2014).

Although extensively studied for decades, recent data on CoQ10 have painted an exciting albeit incomplete picture of the multiple facets of this molecule's function (Laredj et al., 2014).

In addition to its role as a component of the mitochondrial respiratory chain and our only endogenously synthesized lipid-soluble antioxidant, in recent years CoQ10 has been found to have an increasing number of other important functions required for normal metabolic processes (Bentinger et al., 2010).

CoQ10 is also an antioxidant that specifically prevents the oxidation of lipoproteins and the plasma membrane (González-Mariscal et al., 2014).

The CoQ10 - physical exercise relationship. A Pubmed chronological review

CoQ10 supplementation increased total CoQ concentration in slow-twitch muscles, and was useful for reducing exhaustive exercise-induced muscular injury by enhancing stabilization of muscle cell membrane (Kon et al., 2007).

Oral administration of CoQ10 improved subjective fatigue sensation and physical performance during fatigue-inducing workload trials and might prevent unfavorable conditions as a result of physical fatigue (Mizuno et al., 2008).

Studies on CoQ10 and physical exercise have confirmed its effect in improving subjective fatigue sensation and physical performance and in opposing exercise-related damage (Littarru & Tiano, 2010).

According to these results, CoQ10 may show performance-enhancing effects during repeated bouts of supramaximal exercises and CoQ10 might be used as an ergogenic aid (Gökbel et al., 2010).

CoQ10 supplementation partially prevents the increase in lipid peroxidation after repeated short-term supramaximal exercise (Gül et al., 2011).

CoQ10 supplementation before strenuous exercise decreases oxidative stress and modulates inflammatory signaling, reducing subsequent muscle damage (Díaz-Castro et al., 2012).

A relationship is thought to exist between dosage and maintenance of physiological effects associated with the running time (Maruoka et al., 2014).

Fatigue mechanism. A Pubmed chronological review

Mental fatigue manifests as potentially impaired cognitive function and is one of the most significant causes of accidents in modern society. There is accumulating evidence supporting the existence of mental facilitation and inhibition systems. These systems are involved in the neural mechanisms of mental fatigue, modulating the activity of task-related brain regions to regulate cognitive task performance (Ishii et al., 2014a).

Performing a continuous mental fatigue-inducing task causes changes in the activation of the prefrontal cortex, and manifests as an increased beta-frequency power in this brain area as well as sleepiness (Tanaka et al., 2014a).

However, the neural activity evoked when we evaluate our level of fatigue may not be related to the subjective level of fatigue. The posterior cingulate cortex is involved in the neural substrates associated with self-evaluation of physical fatigue (Ishii et al., 2014b).

The CoQ10 - mental fatigue relationship. A Pubmed chronological review

CoQ10 treatment significantly reduces fatigue and improves ergonomic performance during exercise and thus may have a potential in alleviating the exercise intolerance and exhaustion displayed by people with myalgic encephalomyelitis/chronic fatigue syndrome (Morris et al., 2013).

Mental fatigue suppresses activities in the right anterior cingulate cortex during physical fatigue (Tanaka et al., 2014b).

The CoQ10 - mental energy relationship. A Pubmed chronological review

CoQ10 could protect the brain by improving cerebral metabolism (Ren et al., 1994).

CoQ10 offers substantial neuroprotection against ischaemia, trauma, oxidative damage and neurotoxins (Baker & Tarnopolsky, 2003).

CoQ10 therapy involves resistance to oxidative stress

and improved brain bioenergetics (Horecký et al., 2011).

CoQ10 is a mobile electron carrier in the mitochondrial respiratory chain (MRC) with antioxidant and potential neuroprotective activities (Aboul-Fotouh, 2013).

The results we obtained on the action of CoQ10 therapy are consistent with data from recent studies on the use of CoQ10. However, the literature on mental fatigue and mental energy in physical exercise is scarce. The present study brought new data on the benefits of CoQ10 in reducing mental fatigue and increasing mental energy in physical exercise.

Conclusions

1. Under CoQ10 influence, MF and ME were significantly modified.
2. CoQ10 acted efficiently both on MF and ME.
3. CoQ10 efficiency was noticed in post-exercise stress, at T4.
4. We consider that CoQ10 may be useful in modulating MF and ME, in acute exercise stress.

Conflicts of interest

Nothing to declare.

Acknowledgement

We would like to thank: Doctor Alexandrina Fărăgău, for kindly hosting this study in the medical practice she runs, and Eng. Dr. Nicolae Colceriu for botanical counseling and his contribution to statistical data processing.

The financing of the study for the acquisition of the treatments used was obtained from sponsorships.

References

Aboul-Fotouh S. Chronic treatment with coenzyme Q10 reverses restraint stress-induced anhedonia and enhances brain mitochondrial respiratory chain and creatine kinase activities in rats. Behav. Pharmacol. 2013; 24(7):552-560.

Aussel L, Pierrel F, Loiseau L, Lombard M, Fontecave M, Barras F. Biosynthesis and physiology of coenzyme Q in bacteria. Biochim Biophys Acta. 2014;1837(7):1004-1011.

Baker SK, Tarnopolsky MA. Targeting cellular energy production in neurological disorders. Expert Opin Investig Drugs. 2003;12(10):1655-1679.

Bentinger M, Tekle M, Dallner G. Coenzyme Q-biosynthesis and functions. Biochem Biophys Res Commun. 20103;96(1):74-79.

Díaz-Castro J, Guisado R, Kajarabille N, García C, Guisado IM, de Teresa C, Ochoa JJ. Coenzyme Q(10) supplementation ameliorates inflammatory signaling and oxidative stress associated with strenuous exercise. Eur J Nutr. 2012;51(7):791-799.

Gökbel H, Gül I, Belviranl M, Okudan N. The effects of coenzyme Q10 supplementation on performance during repeated bouts of supramaximal exercise in sedentary men. J Strength Cond Res. 2010;24(1):97-102.

González-Mariscal I, García-Testón E, Padilla S, Martín-Montalvo A, Pomares-Viciana T, Vazquez-Fonseca L, Gandolfo-Domínguez P, Santos-Ocaña C. Regulation of coenzyme Q biosynthesis in yeast: a new complex in the block. IUBMB Life. 2014;66(2):63-70.

Gül I, Gökbel H, Belviranli M, Okudan N, Büyükbaş S, Başarali K. Oxidative stress and antioxidant defense in plasma after repeated bouts of supramaximal exercise: the effect of coenzyme Q10. J Sports Med Phys Fitness. 2011;51(2):305-312.

Horecký J, Gvozdjáková A, Kucharská J, Obrenovich ME, Palacios HH, Li Y, Vančová O, Aliev G. Effects of coenzyme Q and creatine supplementation on brain energy metabolism in rats exposed to chronic cerebral hypoperfusion. Curr Alzheimer Res. 2011;8(8):868-875.

Ishii A, Tanaka M, Watanabe Y. Neural mechanisms of mental fatigue. Rev Neurosci. 2014a. [Epub ahead of print]

Ishii A, Tanaka M, Yamano E, Watanabe Y. The neural substrates of physical fatigue sensation to evaluate ourselves: a magnetoencephalography study. Neuroscience. 2014b;261:60-67.

Jurcău R, Colceriu N, Jurcău I. Influence of a Romanian phytotherapic produce called „Antistres", containing Ginseng, on anxiety and salivary Cortisol, in one exam of exams student stress. International Journal of Education and Psychology in the Community (IJEPC). 2013;3(2):38-51.

Jurcău R, Jurcău I. Influence of a green tea extract product on oxidative stress and muscle fatigue sensation in sedentary people subjected to physical exercise. Palestrica Mileniului III. 2013;14(2):90-95.

Kon M, Kimura F, Akimoto T, Tanabe K, Murase Y, Ikemune S, Kono I. Effect of Coenzyme Q10 supplementation on exercise-induced muscular injury of rats. Exerc Immunol Rev. 2007;13:76-88.

Laredj LN, Licitra F, Puccio HM. The molecular genetics of coenzyme Q biosynthesis in health and disease. Biochimie. 2014;100:78-87.

Littarru GP, Tiano L. Clinical aspects of coenzyme Q10: an update. Nutrition. 2010;26(3):250-254.

Maruoka H, Fujii K, Inoue K, Kido S. Long-term Effect of Ubiquinol on Exercise Capacity and the Oxidative Stress Regulation System in SAMP1 Mice. J Phys Ther Sci. 2014;26(3):367-371.

Mizuno K, Tanaka M, Nozaki S, Mizuma H, Ataka S, Tahara T, Sugino T, Shirai T, Kajimoto Y, Kuratsune H, Kajimoto O, Watanabe Y. Antifatigue effects of coenzyme Q10 during physical fatigue. Nutrition. 2008;24(4):293-299.

Morris G, Anderson G, Berk M, Maes M. Coenzyme Q10 depletion in medical and neuropsychiatric disorders: potential repercussions and therapeutic implications. Mol Neurobiol. 2013;48(3):883-903.

Ren Z, Ding W, Su Z, Gu X, Huang H, Liu J, Yan Q, Zhang W, Yu X. Mechanisms of brain injury with deep hypothermic circulatory arrest and protective effects of coenzyme Q10. J Thorac Cardiovasc Surg. 1994;108(1):126-133.

Tanaka M, Ishii A, Watanabe Y. Neural effects of mental fatigue caused by continuous attention load: a magnetoencephalography study. Brain Res. 2014a;1561:60-66.

Tanaka M, Ishii A, Watanabe Y. Neural effect of mental fatigue on physical fatigue: a magnetoencephalography study. Brain Res. 2014b;1542:49-55.

Web sites

(1) http://www.daciaplant.ro/coenzima-q10-forte-112121--p180972.html - accessed on 4.04.2013

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 193–199

"It's easy to learn from movement": learning through the Eshkol-Wachman Movement Notation (EWMN)

"Este uşor să înveţi din mişcare": învăţarea prin sistemul de notaţie Eshkol-Wachman (EWMN)

Tali Ronen[1, 2], Emilia Florina Grosu[2]
[1] *School for the Art of Dance - Kibbutzim College of Education, Technology and Arts, Tel-Aviv, Israel*
[2] *Faculty of Physical Education and Sport, "Babeş-Bolyai" University Cluj-Napoca*

Abstract

Background. Studies exploring the relation between human body movement and learners' achievements show that movement activity facilitates the internalization of learning concepts. The article draws on the rationale that bodily-kinesthetic intelligence in learning can be analyzed and opportunities for combining this intelligence with other intelligences can be explored to corroborate the contribution of integrating movement in teaching. The Eshkol-Wachman Movement Notation (EWMN) is a language based on an analytical method defining units necessary for describing the human body in space and time.

Aims. The objectives of the research were to implement an intervention program, using EWMN, in teaching two geometry topics: angles and symmetries, and to examine whether learning by an intervention program will improve knowledge of these two subjects.

Methods. 121 pupils participated in the study (N = 121) from four classes: two 3rd grades and two 4th grades, two experimental groups and two control groups. A knowledge test questionnaire from the Israeli Ministry of Education was conducted to examine the movement intervention program by means of EWMN. Statistical analysis of data was performed using SPSS.

Results. The experimental groups that learnt the topics through EWMN had significantly better academic achievements (M=71.92; SD=22.73) than the control groups who studied by the usual method prevalent today (M=60.49; SD=20.01). This difference was significant: P<0.01 (F (1.117) =9.67, P<0.01).

Conclusion. EWMN allows the illustration of the theory through conscious movement of the human body and through creative processes, thus promoting the learning of the two subjects.

Keywords: EWMN, movement learning, angles, symmetries.

Rezumat

Premize. Studiul prezentat se referă la explorarea relaţiei dintre mişcarea corpului uman şi realizările elevilor. Cercetarea arată că activitatea motrică, mişcarea, facilitează internalizarea unor concepte de învăţare. Articolul se bazează pe raţionamentul că putem analiza atât locul inteligenţei corporal-kinestezice în procesul de învăţare, cât şi capacitatea de a explora oportunităţile pentru combinarea acestei informaţii cu celelalte inteligenţe şi de a confirma contribuţia integrării mişcării în procesul de predare. Eshkol-Wachman Movement Notation (EWMN) este un limbaj bazat pe metode analitice privind definirea unităţilor necesare pentru a descrie corpul uman în spaţiu şi timp.

Obiective. Obiectivele cercetării au fost implementarea unui program de intervenţie, folosind EWMN, în predarea a două subiecte de geometrie, unghiuri şi simetrii, şi examinarea faptului dacă învăţarea unui program de intervenţie va îmbunătăţi cunoştinţele în predarea acestor două subiecte.

Metode. 121 de elevi au participat la studiu (N = 121) de la patru clase: două clase a treia şi două clase a patra, două grupuri experimentale şi două grupuri de control. Chestionarul de testare cunoştinţelor a fost realizat de către Ministerul Israelian al Educaţiei şi a fost realizat în vederea măsurării şi examinării programului de intervenţie a mişcării prin intermediul EWMN. Analiza statistică a datelor a fost efectuată cu ajutorul programului SPSS.

Rezultate. Grupurile experiment care au învăţat subiectele prin EWMN au avut realizări semnificativ mai bune academice (M = 71,92; SD = 22,73), comparativ cu grupurile de control care au studiat prin metoda predominantă astăzi (M = 60,49; SD = 20,01). Această diferenţă a fost evidenţiată cu un nivel de semnificaţie de P<0,01 (F (1,117) = 9,67, P<0,01).

Concluzii. EWMN permite ilustrarea unui teme teoretice prin mişcarea conştientă a corpului uman şi prin procesele de creaţie. Se promovează astfel învăţarea celor două subiecte, unghiuri şi simetrii, prin folosirea sistemului EWMN, care uşurează învăţarea.

Cuvinte cheie: EWMN, învăţarea mişcării, unghiuri, simetrii.

Received: 2014, July 15; *Accepted for publication:* 2014, July 30;
Address for correspondence: School for the Art of Dance - Kibbutzim College of Education, Technology and Arts, Tel-Aviv, Israel, Postal Code: 62507
E-mail: taligili@hotmail.com or emiliaflorina.grosu@gmail.com

Introduction

Movement inside the womb gives us the first sensation of the world and the beginning of our experiences and knowledge of the laws of gravity. Each movement is a sensomotor event associated with the comprehension of the physical world, the world from which all new learning is derived. Movement stimulates and activates many of our mental capabilities. It combines and sets down information and new experiences in our nervous system and is essential to all the actions by means of which we embody and express learning, understanding and ourselves (Hanford, 2002).

Integrating movement in learning depends on the teachers' approach and willingness to create a stimulating environment for action in an open and supportive learning atmosphere. Jensen (2003) argues that for pupils, learning which integrates physical practice is easier to master, is better remembered and mostly creates positive experiences which might be internalized and recalled for a long time. This is applied learning which provides great sensory input to the brain. Thus, by performing movement assignments, pupils can express in an active, non-verbal manner the understanding of familiar or new learning material.

In all learning environments and opportunities, pupils are different from each other in their data absorption and processing. This differentiation in learning ways and processing and hence in learning styles is connected, among others, with the various intelligences which comprise them. In order to create a meaningful learning experience, pupils should be allowed to study in their own unique way which is related to their characteristics as well as the intelligences with which they are endowed (Cohen, 2007).

According to the multiple intelligences theory conceived by Gardner (1996), we can analyze the place of the bodily-kinesthetic intelligence in learning and explore options for combining this intelligence with the other intelligences in order to corroborate the contribution of integrating movement in teaching. Integrating movement in learning creates immediate conditions for active learning. Movement-integrated learning results in bodily pleasure. When such active learning is supported by a positive atmosphere and by setting a motor and cognitive challenge, the pupils' internal motivation is reinforced, creating a sense of inner reward (Segev-Tal & Galili, 2010).

When combined with theoretical learning, movement constitutes in the preparatory stage towards learning an exercise of delayed movement which does not mean lack of movement but control over the movement and preparation for the learning focus (Shoval, 2009).

The theory of experiencing *"mediated learning"* (Feuerstein, 1998), indicating the importance of education in creating the intelligence, is responsible for the development of thinking flexibility which guarantees that a stimulus will considerably affect people.

EWMN is a language based on an analytical method which defines the units necessary for describing the human body movement in space and time. The description is done in relation to a geographic-spherical "system of reference" and is written on a special text page representing the body structure (Eshkol & Harries, 2000).

Integrating EWMN in theoretical learning serves bodily-kinesthetic learning, logical-mathematical learning and spatial orientation and it is meaningful to pupils endowed with these intelligences. EWMN enables data structuring: close guidance towards a clear objective, learning a sequence, building movement structures and receiving feedback on accumulated knowledge. The learning is systematic, directed and adapted to pupils' level of knowledge. It is active, leading to thinking flexibility. Thus we can see that the theories conceived by Gardner, Feuerstein and Bruner support the intervention program, based on EWMN, explored in this study.

The intervention program

The intervention program integrates EWMN with two topics of geometry taken from the elementary school curriculum: angles and symmetries. This program was designed following studies and teachers' reports about the difficulties pupils encounter in the internalization of these topics. It was also based on studies illustrating a relation of movement which facilitates theoretical learning (Shoval, 2006) and on EWMN used as a thinking tool, which might help people to observe the movement of the human body (Al-Dor, 2004).

Our world is basically geometric and in order to understand and assess it we need spatial orientation. Developing spatial perception and spatial skills is a pragmatic and useful objective. The use of spatial intelligence is very essential to the development and improvement of young children's mathematical thinking competences (Fadalon & Patkin, 2012).

The Eshkol-Wachman Movement Notation (EWMN)

EWMN enables movement activities and experiences which engage, by their very nature, in the visual perception and spatial-kinesthetic perception as well as in grapho-motor functions and motor-visual coordination.

As its name implies, movement notation is a way of writing movements, similar to writing musical notes. EWMN was conceived in Israel and was first published in 1958 by the late Prof. Noa Eshkol and the late Prof. Avraham Wachman (Eshkol & Wachman, 1958). It is one of the four major international movement notations: Benesh, CMDN (Chinese movement notation), Lavan and Eshkol-Wachman Movement Notation.

The signs of EWMN consist of figures, letters and accepted graphical signs. By using the diversified combinations of the signs, one can describe directions, paths and any movement event which is visible and is written on a special manuscript page, representing the body structure (Eshkol & Harries, 2000). In EWMN, learning is conscious and creative thinking demonstrates the symbols of the language by a practical way of bodily movement. The notation is based on a conscious, controllable and measureable movement.

This is the mindful movement which services the theoretical learning process and which is performed as part of an activity leading to learning. In order to connect movement and learning, we should choose movements over which learners do not have automatic control. On the contrary, they have to make decisions in order to perform

them (Shoval, 2006).

The principles of EWMN can be used to disassemble bodily-movement events into basic components and symbolize these events in a limited system of agreed symbols. This facilitates a fruitful relation between movement and core skills of formal learning (reading, writing, calculus) (Sapir & Blum, 2002).

Below are the principles of EWMN which underpinned the intervention program:

1) *The movement of the body parts is circular*

Every part of the human body has a circular movement from the joint to which it is connected. The movement of every axis of a body part forms an angle in relation to the adjacent part. From any axis of a body part we can form a circle or part thereof. The starting position and movement of the body part can be viewed as forming the angle. Consequently, the topic of angles as part of a circle can be illustrated, understood and organically and naturally linked to movement lessons (Fig. 1).

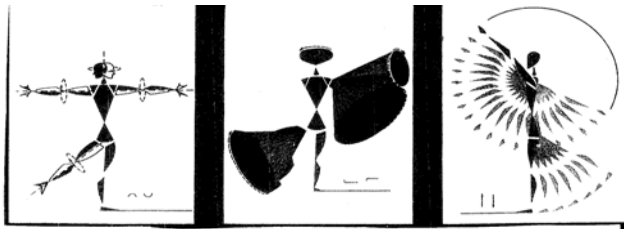


Fig. 1 – Drawn example of the circular movement of the human body (Eshkol & Harries, 1998).

A circle can be divided in different ways. In the division chosen for the intervention program of this study, one circle has 8 parts. Each part equals 45° and is referred to as one quantity (Fig. 2). This division is convenient for defining the movement of angles in people's life. For example: forward, backward and downward 180º or north-east 45º.

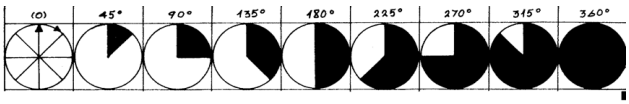


Fig. 2 – Movement quantity in EWMN (Eshkol & Shoshani, 1982).

2) *The system of reference of EWMN is called 'system of reference'*

This is a spherical system which exists in every joint. Body parts (joints) are similar to straight lines moving inside a sphere and therefore, their movement is circular. Space is divided into latitude lines - horizontal - and longitude lines - vertical - which create together a spherical system of reference. Thus, every body part wherever it is located is defined by a longitude line and a latitude line - position. The positions and movements of the body parts can be notated in a special manuscript page which is adapted to the structure of the human body (Fig. 3).

Angles and symmetries

Angles

An angle has a vertex from which two lines called legs are pointing. The length of the legs does not change the angle and has no effect on its size. Thus, every joint in the body is a vertex of an angle and the adjacent joints are its legs regardless of their length.

The angle size is determined according to the range between its two legs which have a common starting point. The angle name is given according to its size (Fig. 4):

- A straight angle is formed when the range between its two legs is 90 degrees and it makes a quarter of a whole rotation.
- An acute angle is formed when the range between its two legs is smaller than 90 degrees and the movement is less than a quarter of a whole rotation.

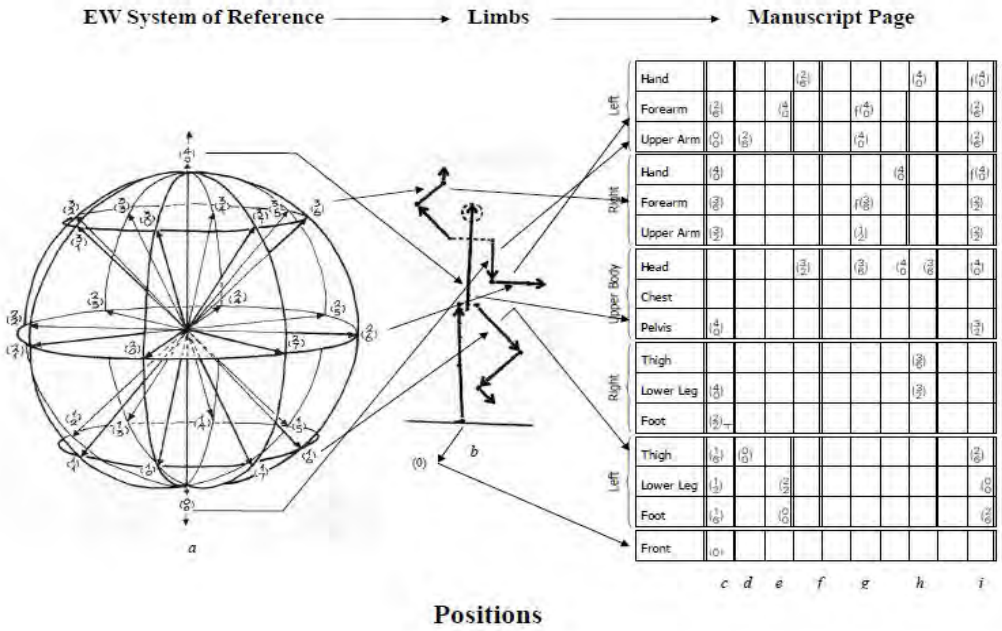
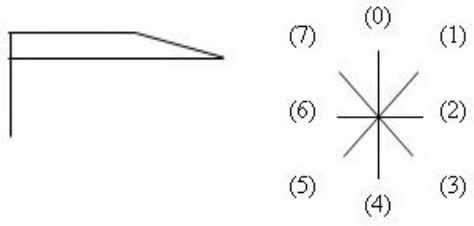


Fig. 3 – EWMN spherical system of reference, its connection to the human body, according to the manuscript page (Harries & Sapir, 2009).

Directions of the EWMN horizontal system



Step directions and locomotion											
Right leg	(0)	(0)		(0)		(2)		(3)		(6)	
Left leg	(0)		(0)		(0)		(2)		(6)		(6)
Angle type	–	–	straight	straight	straight	straight	straight	obtuse	acute	straight	straight

Fig. 4 – Step directions and locomotion in space on the topic of angles in EWMN.

- An obtuse angle is formed when the range between its legs is larger than 90 degrees and smaller than 180 degrees and the movement is between a quarter and a half of a whole rotation.

During the movement lessons by means of EWMN, the pupils distinguish and comprehend the topic of angles through writing, reading and movement of this language. The principles of the system of reference can be used for teaching the circular movements which form angles.

An example of movement teaching taken from the EWMN lesson on the topic of angles (Fig. 4):

- The following exercise relates to step directions and locomotion in space. All the pupils face direction (0). The teacher gives a direction (according to the horizontal system of EWMN) as well as the number of steps, and the pupils will walk according to the instructions. A total of 10 steps.

- The pupils will try to remember the created path, will guess what the drawing is and which angles are included in it.

- The pupils will write the step directions ((x) = step direction), will sketch the drawing and indicate the angles on the manuscript page.

Symmetries

The geometric basis of EWMN and the consolidation of its components into a coherent system with rules and regulations of its own link the world of movement to systems of concepts and symbols, which are studied at school. For example, reflection and rotational symmetries which can be defined by the system of reference (Fig. 5).

Reflection symmetry is a copy of the plane, defined by means of a straight line on the plane. Thus, each point on the plane is copied to a point on the other side of the straight line and at the same distance from it.

Rotation symmetry occurs when the center of the symmetry is such a point that a rotation smaller than a full rotation around it copies the shape on itself.

The natural given of extremities in the human body - two legs and two arms and the ability to move them – enables a view of rotational and reflection symmetry. The ability to advance in space while noticing the course of progress on the group – in each of the symmetry types – allows additional illustration of the topic and the understanding thereof.

Based on the spatial division of EWMN, the movement of the body parts in the two symmetry types can be examined.

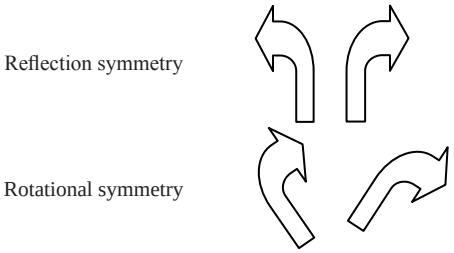


Fig. 5 – Reflection & rotational symmetry.

An example of movement teaching taken from the EWMN lesson on the topic of symmetries:

- The following exercise relates to step directions and locomotion in space.

Division into 4 pupil groups. Each group will compose together a locomotion path in different directions so that paths of reflection and rotational symmetry are formed between the group members. Every pupil will draw and write the directions in which he or she walked ((x) = step direction). A line from one point to another – is a step. Finally, the pupils will walk together the locomotion paths (Fig. 6).

Hypothesis

The intervention program, using the Eshkol-Wachman Movement Notation, will improve the level of knowledge of 3rd graders in the topic of angles and that of 4th graders in the topic of rotational and reflection symmetry, in relation to frontal teaching in class.

Material and methods

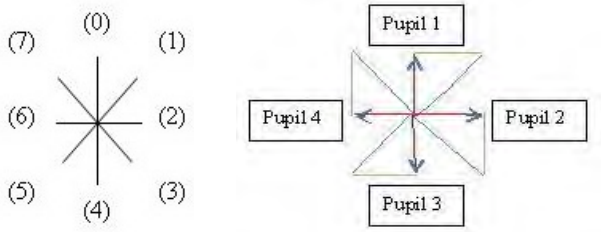
The study was approved by the Ethics Committees of the "Lev Ha'emek" Primary School, the principal, teachers and parents of pupils participating in the study. The ethical principles of confidentiality, anonymity and informed consent were applied to the study subjects.

Research protocol

a) *Period and place of the research*

The study was conducted as part of a three-year intervention program in the "Lev Ha'emek" Primary School, in the north of Israel.

Directions of the EWMN horizontal system



Pupil 1	R. leg	(0)	(0)		(2)		(5)	
	L. leg	(0)		(0)		(2)		(5)
Pupil 2	R. leg	(2)	(2)		(4)		(7)	
	L. leg	(2)		(2)		(4)		(7)
Pupil 3	R. leg	(4)	(4)		(6)		(1)	
	L. leg	(4)		(4)		(6)		(1)
Pupil 4	R. leg	(6)	(6)		(0)		(3)	
	L. leg	(6)		(6)		(0)		(3)
Symmetry type			Reflection		Rotational		Reflection	
			Step 1	Step 2	Step 3	Step 4	Step 5	Step 6

Fig. 6 – Step directions and locomotion in space on the topic of symmetries in EWMN.

b) *Subjects and groups*

The present study consisted of an experiment in which 121 pupils from four classes participated: two 3rd grades and two 4th grades (Fig. 7). Each class had about 30 pupils. Two experimental groups: 3rd grade class A and 4th grade class A and two control groups: 3rd grade class B and 4th grade class B were chosen randomly as members of the two groups. Each class included boys and girls who had been learning EWMN from the 1st - 3rd grades.

A movement intervention program by means of EWMN was implemented, dealing with two geometry topics which have a direct relation to bodily movement. The movement of human body limbs is circular and, hence, the topic of angles was chosen. The body parts are symmetrical and reflection (upper and lower extremities) and, thus, the topic of "reflection symmetry" and "rotational symmetry" were chosen. The choice of two topics expands the research and allows checking the effect of the intervention program.

These geometry topics are studied according to the Israeli Ministry of Education curriculum. The 3rd graders and the 4th graders have these topics taught by the home-class teacher. Some of the lessons are given to the whole class and some of them to half the class. The same applies to the experimental and control groups, respectively.

The experimental group pupils, each class separately, studied with the movement teachers the movement lessons by means of EWMN according to the learning topics: the 3rd graders studied the topic of angles and the 4th graders studied the topic of reflection and rotational symmetry. The control groups, each grade separately with a teacher of its own – the home-class teacher – had lessons about the same geometry topics. The pupils sat on chairs – listened, read and wrote on the desk in front of them. They used notebooks and books of the "Simply Arithmetics" curriculum of the Israeli Ministry of Education (2008), without learning the topic through movement. The movement lessons of the experimental groups were parallel to the lessons of the control groups.

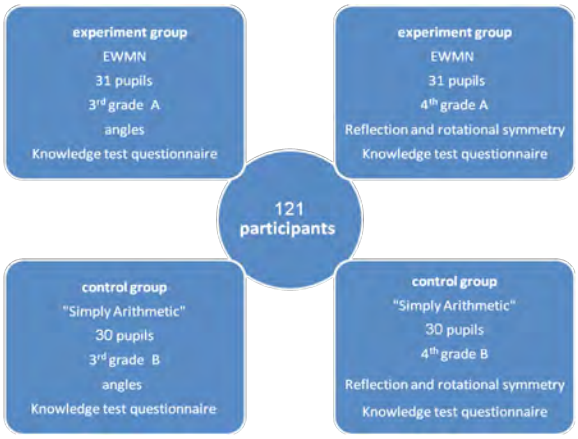


Fig. 7 – Research data.

c) *Tests applied*

At two points of time: before and after the experiment. The knowledge test questionnaire of the Israeli Ministry of Education examined the 3rd graders' level of knowledge on the topic of angles and the 4th graders' knowledge of the topic of rotational and reflection symmetry.

d) *Statistical processing*

In order to check whether a change occurred in the scores of the experimental group and the control group, a two ways ANOVA test was performed.

The variables between the subjects were the grades - 3rd grade or 4th grade and group affiliation - experimental group or control group. The variable among the subjects was the time of measurement (pre-study and post-study).

Results

Prior to the intervention program, the knowledge test questionnaire was administered. It showed that the pupils were not versed in the topics dealt with by the intervention program. The 3rd graders and 4th graders in both the experimental and the control groups did not understand the terms mentioned in the knowledge test questionnaire and hence failed to answer the questions. The learning material was new for them. The pupils in the four groups

demonstrated three patterns of answers in the knowledge tests prior to the intervention program:

- 52.3% of the pupils did not indicate any answer;
- 27.1% of the pupils wrote they had guessed the answers and they did not understand them or indicated all of them as correct;
- 12.2% of the pupils gave incorrect answers.

Following the intervention program, the knowledge test questionnaire was administered and the data were analyzed. Table I presents the means and standard deviation in the knowledge test questionnaire after conducting the study on the 3rd grade and 4th grade in both the experimental and the control groups.

Figure 8 illustrates a difference in the scores of the different affiliation groups (regardless of the grade - 3rd or 4th). The experimental group scored significantly higher (M=71.92; SD=22.73) than the control group (M=60.49; SD=20.01). This difference was on a significance level of $P<0.01$ ($F(1.117)=9.67$, $P<0.01$).

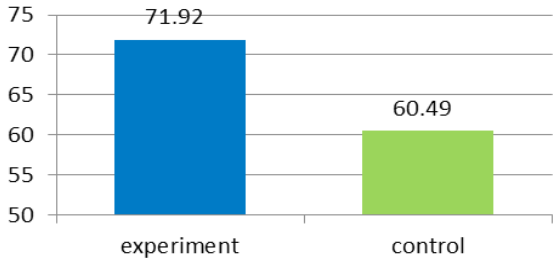


Fig. 8 – The difference in scores between the experimental and control groups (regardless of the grade - 3rd or 4th).

Figure 9 presents the data analysis following the intervention program by division into experimental groups and control groups in the 3rd grade and 4th grade. The scores of the experimental group are higher than the scores of the control group. That is, the knowledge test mean scores of the 3rd grade and 4th grade experimental groups were higher than those of the control groups following the intervention program.

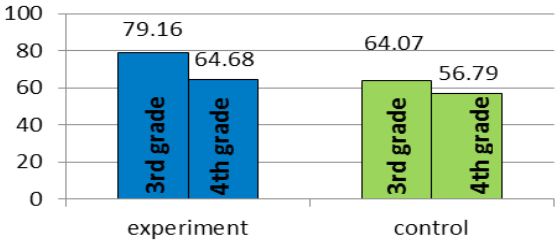


Fig. 9 – The difference in scores between the experimental and control groups according to the grade (3rd or 4th).

Discussion

The finding emerging from the study clearly shows that learning by means of an intervention program based on EWMN has indeed promoted the learning of a theoretical topic. According to the research findings, the attainments in geometry in the topic of angles and symmetries of the pupils who participated in the experimental group were higher than those of pupils who belonged to the control group.

This finding is in line with the theoretical rationale presented above. That is, the finding is supported by the 'mediating learning' theory of Feuerstein (1998), namely that intervention program is the mediator. The teacher uses the principles of mediating learning through EWMN for theoretical learning.

Moreover, this finding is corroborated by the 'Multiple Intelligences' theory (Gardner, 1996), putting an emphasis on three intelligences: bodily-kinesthetic intelligence, logical-mathematical intelligence and spatial intelligence. According to the MI theory, bodily-kinesthetic intelligence manifested by the pupils' ability to move and to learn the theoretical topics through body movement. Logical-mathematical intelligence manifested by the pupils' ability to cope successfully with analytical thinking and conclusion drawing when learning abstract geometrical topics. Spatial intelligence manifested by the pupils' ability to perceive accurately the visual-spatial world and to process the topic of angles and the topic of symmetries. In addition, this finding is supported by Bruner's 'knowledge construction' theory (Olson, 2007) since the use of movement and visual illustration by means of EWMN (Eshkol & Harries, 2000) allows implementing the acquired knowledge and linking the knowledge to other topics. These theories which underpinned the rationale of the intervention program created a synergy which enhanced the learning of theoretical topics - angles and symmetries – and brought about the expected results, namely an increase in pupils' attainments in geometry.

Conclusions

This finding illustrated the power embodied in learning through movement by means of EWMN which promotes theoretical learning. Herein resides the contribution of this study to knowledge in the field of education by movement.

The practical conclusions emerging from the discussion are as follows:

1. Elementary school pupils can better understand the topic of angles and the topic of symmetries through the body movement and by using the intelligences with which they are endowed and thus attain higher scores in these topics.

Table I

Means and standard deviations in the knowledge test questionnaire following the study on the 3rd grade and 4th grade in both the experimental groups and the control groups.

Total						4th grade						3rd grade					
Total N=121		E N=62		C N=59		Total N=50		E N=31		C N=29		Total N=61		E N=31		C N=30	
Std	M	Std	M	Std	M	Std	M	Std	M	Std	M	Std	M	Std	M	Std	M
22.06	54.89	22.73	71.92	20.01	60.49	15.66	59.95	16.56	63.35	14.02	56.31	25.73	71.74	25.44	79.16	24.10	64.07

Affiliation group: E (experimental group), C (control group). M (mean), STD (standard deviation).

2. The intervention program by means of EWMN which integrates movement, reading and writing can considerably improve the pupils' comprehension and higher scores in the topics of angles and symmetries.

Conflicts of interest

There are no conflicts of interest.

Acknowledgement

This paper uses partial results from the first author's ongoing PhD thesis carried out at Babes-Bolyai University, Faculty of Physical Education and Sport, Cluj-Napoca, Romania.

References

Al-Dor N. The impact of learning Eshkol-Wachman Movement Notation (EWMN) on the developing of coordination. Thesis Submitted in Partial Fulfillment of the Requirements for the Ph.D. Degree. Budapest: Eötvös Loránd University, 2004.

Cohen N. Multiple intelligences theory of Prof. Howard Gardner. Jerusalem: Branco-Weiss Institute, 2007.

Eshkol N, Harries JG. Movement Notation- part 2: The sphere of movement. Holon: The Movement Notation Society, 2000.

Eshkol N, Harries JG. Eshkol-Wachman Movement Notation: A Survey. Holon: The Movement Notation Society, 1998.

Eshkol N, Shoshani M. Movement Notation. Comparative Study of Labanotation and Eshkol-Wachman Movement Notation Part Two. Holon: The Movement Notation Society, 1982.

Eshkol N, Wachmann A. Movement notation. London: Weidenfeld and Nicholson, 1958.

Fadalon L, Patkin D. Developing spatial perception of boys and girls at the 3rd grade by means of an extra-curricular unit. Mispar Hazak, 2000(21), Haifa: University of Haifa, 2012, 31-36 [Hebrew].

Feuerstein R. Man as a Changing Entity. The International Center for the Promotion of Learning Ability. Tel Aviv: Ministry of Defence Publications, 1998 [Hebrew].

Gardner H. Theory of Multiple Intelligences from Theory to Practice. Jerusalem: Branco Weiss Institute, 1996.

Hanford K. Wisdom in movement. Why learning does not take place in our brain only. Nord publications, 2002; 99-104 [Hebrew].

Harries J, Sapir T. About Time in Eshkol-Wachman Movement Notation. Tel Aviv: Mayshav Ltd, 2009. [Hebrew].

Jensen A. Educate children according to their brain, implications of brain research on teaching and learning. Jerusalem: Branco Weiss Institute, 2003 [Hebrew].

Olson, D. Jerome Bruner: the cognitive revolution in educational theory. London & New York: Continuum. 2007.

Sapir T, Blum H. Improving basic learning abilities through movement and movement notation. Paper presented at the 4th international conference for teacher training, Achva Academic College, Israel, 2002.

Segev-Tal R, Galili R. Moves to learn. Integrating movement in the teaching of learning contents in kindergartens and first grades of elementary school. Tel Aviv: MOFET Institute, 2010;37-38 [Hebrew].

Shoval E. Moving and learning, body movement and its contribution to learning. Tel-Aviv: Ach Publishing House Ltd, 2006, 100-106 [Hebrew].

Shoval E. Relation between learning activities while moving and improving academic attainments in the topic of angles. Dapim. Tel Aviv: MOFET Institute, 2009, 185-211 [Hebrew].

***. Ministry of Education, Culture and Sport. Mathematics curriculum for the 1st - 6th grades for all sectors. Jerusalem: Ministry of Education, Culture and Sport, Pedagogical Secretariat, Section for the planning and development of curricula, 2008 [Hebrew].

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 200–206

Exercise quantification in physical training by the computerized guidance of running tempos
Cuantificarea efortului în pregătirea fizică, prin dirijarea computerizată a tempourilor de alergare

Nicolae Neagu
University of Medicine and Pharmacy, Târgu Mureş

Abstract

Physical training constitutes a real reference as one of the most important exigencies to obtain high performance. Accordingly, as the training moves forwards in order to achieve high performance, its design requirements must increase exponentially. This is because the evolution of individual results tends to flatten. It is a phenomenon acknowledged by most specialists, faced with a slower progress in athletes, sometimes followed by stagnation or a setback in performances. Therefore, our work presents an instrument that provides quantifiable and available information in the management of training exercise by directing the running tempos, followed by differentiated and individualized approaches of training methods. We wish to support coaches and physical trainers by presenting new criteria, several objective and valid reference scales in order to make the effort parameterization more efficient from two points of view: quantitative and qualitative.

Thus, we present a computational grid pattern of exercise intensity, assisted by a personal program, TEMPOSOFT, which converts the running tempos to time units for several distances, between 20-800 m. This workout methodology is addressed to any coach and/or physical trainer, regardless of individual or team sports disciplines, in direct relation to the way in which the effort level is recorded and managed, using concrete and measurable time units.

Keywords: computerized guidance, effort compliance, physical training, timing grid, running tempos, split time.

Rezumat

Pregătirea fizică constituie o reală referinţă ca o importantă exigenţă în obţinerea marii performanţe. Pe măsura înaintării în marea performanţă, cerinţele design-ului acesteia creşte exponenţial. Aceasta, din cauza faptului că evoluţia rezultatelor individual tinde să se aplatizeze. Este un fenomen recunoscut de majoritatea specialiştilor, puşi în faţa unui progres mai lent al sportivilor, uneori urmat de stagnare sau regres al performanţelor. De aceea studiul nostru îşi propune să prezinte un instrument care oferă informaţii cuantificabile şi disponibile în managementul efortului în antrenament, prin dirijarea tempourilor de alergare, urmate de abordări diferenţiate şi individualizate ale metodelor de antrenament. Dorim, astfel, să sprijinim antrenorii şi preparatorii fizici, prezentându-le noi criterii, câteva referinţe scalare, obiectivizate şi valide, cu scopul parametrizării efortului, din două puncte de vedere: cantitativ şi calitativ.

Astfel, prezentăm modele computerizate de scale ale intensităţii efortului, asistate de un program elaborat de noi, denumit TEMPOSOFT, care transformă tempourile de alergare în unităţi de timp, pentru mai multe distanţe, cuprinse între 20-800 m. Această metodologie de lucru se adresează oricărui antrenor sau preparator fizic, cu referire la discipline sportive individuale sau de echipă, în relaţie directă cu modul în care se înregistrează şi se dirijează nivelul efortului, utilizându-se unităţi concrete de măsurare a timpilor realizaţi.

Cuvinte cheie: asistenţă computerizată, complianţă la efort, pregătire fizică, scală de timpi, tempou de alergare, timp intermediar.

Received: 2014, August 12; *Accepted for publication:* 2014, September 1;
Address for correspondence: University of Medicine and Pharmacy, Târgu Mureş, Gheorghe Marinescu Str. No. 38, 540139, Romania
E-mail: neagutgm@gmail.com ; neagu.nicolae@umftgm.ro

Introduction

Physical training, one of the fundamental components of the training process, is becoming more and more a real methodological benchmark, being one of the most important requirements to obtain high performance. Its effective management must be grounded as objectively as possible in the conduct of proceedings on a continuous monitoring and evaluation activity by those who manage it.

As it progresses on the upward spiral of achieving high performance, the design of the requirements, planning and organization of the training process increases exponentially (Fig.1). This is because in the development of the athlete's career, the upward trajectory of his/her individual performance progress tends to flatten. It is a phenomenon observed and recognized by the majority of the specialists and sometimes stoically accepted by some of them, faced with a slow progress of the athletes' performances, followed by a temporary standstill and subsequently even a regression after a time period of marked progress (Neagu, 2010).

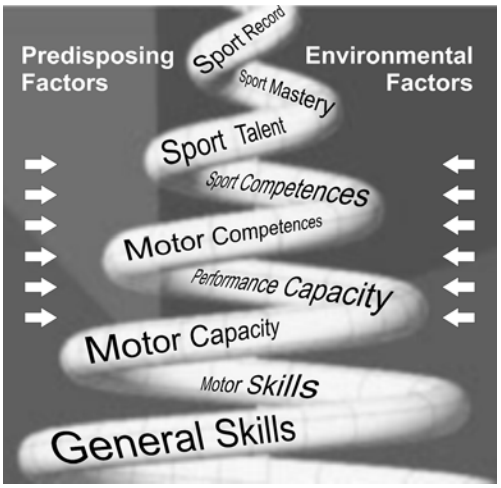


Fig. 1 – The upward spiral of achieving high sport performance under the influence of predisposing and environmental factors (Neagu, 2010).

The factorial rank of physical training as a component of sport training

Physical training, along with other two components, *technical and tactical training*, which are in our view the foundation of the high performance process, are supported by other components, all with different factorial ranks: *theoretical and biological training for competition, psychological, artistic training and the restoration period* (Fig. 2).

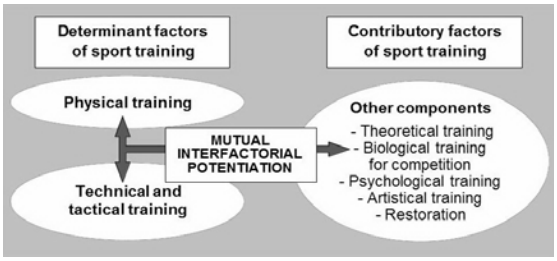


Fig. 2 – The factorial rank and interrelationships between the sport training components (Neagu, 2012).

The factorial rank of each component influence has a special variability, controlled by the coach in relation with several references: the training period of the annual cycle (i.e. preparatory, pre-competitive and competitive periods); the athlete's peculiarities configuration; the competition timetable; the proposed objectives, means and methodology; other resources etc.

In the design of the macro-cycle training program (i.e. annual cycle) or the meso-cycle training program (i.e. pre-competitive period or a particular stage etc.), one of the references is represented by the athlete's current level of training. More specifically, we are talking about the development level of motor qualities, correlative to some sports discipline or sport events specificities that will determine or influence the technical and tactical individual training level.

Only the achievement of some rank relationships between the components of the training process imparts its optimal functionality, which generates real and high yield efficiency. We emphasize that in our view not all training components have the same rank factorial influence. Consequently, we discuss about a particular hierarchy of these components, depending on their factorial rank, determinant or contributory (Fig. 3).

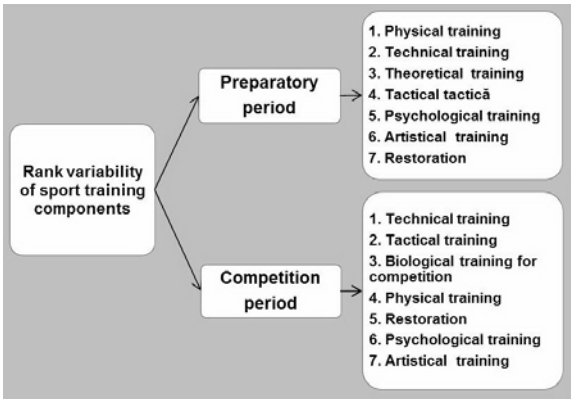


Fig. 3 – Factorial rank variability related to the objectives of training periods in the annual cycle (Neagu, 2012).

We must mention that this hierarchy is not a static one. It has a certain dynamics and variability in relation to the preparatory period of the annual cycle. The most eloquent example is the high rank of the *recovery component* within the transition period related to its position in other training periods. Another example is the changing of the principal role of *physical training* from the preparatory period to a secondary or tertiary place during the competition period, a rank exchanged with the *technical and tactical training components*.

To enable action by conducting the sport training process in the high-level development of the physical training indicator, general or specific, a more precise and rigorous substantiation of the main parameters of applied effort: *volume, intensity and density* is required.

From our point of view, this highly effective approach can be reached only through the configuration of a specific toolbox of the coach portfolio which would make the available elements as clear as possible, quantifiable and accessible in the management of exercise training, related

to its orientation and guiding, based on the momentary peak performance of the athlete. The effort quantification, the pauses between the exercise sets, followed by a differentiated and individualized approach of training (targeting its content, strategy and methodology) will become real instruments, continuous generators of high performance in sports training.

This supports the postulate that we found in a series of studies on the role and position of physical training within the sports training components, according to which "any sport technique is subject to physical means that it entails"(Aubert, 2002; Aubert 2003; Aubert 2004).

Regardless of the rank of physical training, especially specific physical training, this should not be interrupted in any annual training period, even in the competition period. The maintaining of high levels of "dynamic topokinetic parameters" and of technical element execution - "morphokinetic parameters" - can be sustained only in the context of continuous physical training (Neagu, 2010; Neagu, 2012).

The synchronous dynamics of physical training and the athlete's compliance to training requests

Taking a number of conceptual elements of *Dynamic Systems Theories* (DST) from mathematics (Gréhaigne & Paul, 2014), the design and the planning of physical training result from the manner in which it engages and interacts with the different periods of the training process. The internal dynamics of the process, the algorithmic succession of its periods determines distinctive management approaches for each of them (Fig. 4).

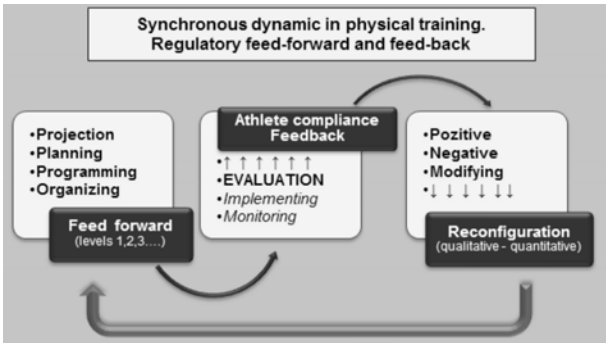


Fig. 4 – Synchronous dynamics of physical training. Regulatory compliance (Neagu, 2012)

The proposed objectives and tasks which must be performed allow some important changes in the evolution of a macro-cycle and/or meso-cycle of the training process. Obviously, the internal dynamics of the training process should be accompanied by a "synchronous dynamics" resulting from the operationalization of the objectives and tasks of each sequence (Neagu, 2012).

The design of the content of each stage followed by the planning and conducting of the training program involves beyond the predictive forwarding of the coach's qualities, the prediction of "the athlete's compliance" to induce multiple effects upon the athlete which was anticipated by the coach design (A/N). "The coach activity as feed forward type will not have the expected results in the lack of regulatory feedback (quantitative and qualitative) of the original interventions designed by himself, respectively, named as *dynamic feedback, wholly integrated* during the monitoring and evaluating of the training process (positive and/or negative feedback, often even modifier feedback" (Neagu, 2012).

The proposed calculating program of running/ locomotion tempos "TEMPOSOFT"

One of the issues faced by coaches in general, and especially coaches who train athletes for sport disciplines or events involving locomotion-type movements, is related to the conversion of working time intensity related to different distances of running or displacement (other ways of locomotion). By studying the literature, we found limited references using optical measuring systems of the athlete's displacement timing, such as *Microgate Timing System, Optojump, Ergotest, IR-Mat* etc. (Bosquet et al., 2009; Casartelli et al., 2010; Glatthorn et al., 2011).

The book *The quantification physical preparation in sport training* (Neagu, 2012) presents several grids with time equivalents of work intensities provided on different levels, depending on the length of the covered distance (by running or by other means of locomotion). The proposed distances are: 20 m.; 30 m.; 40 m.; 50 m.; 60 m.; 80m.; 100 m.; 120 m.; 150 m.; 200 m.; 250 m.; 300 m.; 400 m.; 500 m.; 600 m. and 800 m. The amplitude between the minimum and maximum times for each distance is planned to be applied in several situations of locomotion and for different levels of the athletes. The range between times is 2 1/100 sec. for distances up to 100 m. and 5 1/100 sec. for longer distances. The steps of intensity are between 80-100%, depending on the distance length. The maximum time (100%) is the personal record achieved by an athlete and a basis for calculating the lower levels of intensity (98%, 96%, 94% etc.). We exemplify a grid for the 50 m distance (Table II).

The TEMPOSOFT program solves many of the items above by:

- an exact measurement and record of the athletes' performed timings at a sensitivity of 1/100 sec. (using MGS);
- converting the exercise intensity from percent in nominal times, to be performed by an athlete in a training session;
- providing a concrete data base to the coach in real time, during training sessions, offering instant feedback;
- having functions such as a dynamic exercise regulator in relation to the physical shape of the athletes;
- performing timelines analysis of a race, identifying areas of acceleration / deceleration, stagnation of running or displacement speed.

The elaborated grids are, in our view, a very important guide; a real working tool for any teacher of physical education and sport, but especially for coaches and physical trainers interested in the objectification of the work tempos requested from an athlete. Personally, I have applied these grids since 1987 with very good results in guiding, monitoring and adjusting effort intensity in athletics training sessions (Neagu, 2010).

One particularly important aspect which we underline is the role of these grids in the detection of deceleration

intervals throughout the entire length of running or of other specific locomotion forms. This allowed us to customize and set up the training program in the exact intervals of the running race where we found problems (i.e. deceleration or slowdown). Another significant element is related to the determination of correlations between control tests and competition events. Similarly to highlighted issues above, for the correlation of 10 m. time intervals from the total distance we have found disparities in the timing correlation and we intervened upon the athlete's training program by differentiated (individualized) training.

To facilitate the use of grids, we developed a software program easy to use by any coach, which we called TEMPOSOFT. This is an interactive executable program through which the coach or the physical trainer introduces the running distance of interest, the set time point (the momentary maximum performance of the athlete) and the effort intensity level to work at in a given training session (Table I).

Table I

The manner to use the TEMPOSOFT application for 100 m distance. A sequence from the executable program.

Time	Speed	Levels of intensity - tempos				
		96%	*92%*	*88%*	*84%*	*80%*
11.67	8.57	12.16	12.68	13.26	13.89	14.59
11.69	8.55	12.18	12.71	13.28	13.92	14.61
11.71	8.54	12.20	12.73	13.31	13.94	14.64
11.73	8.53	12.22	12.75	13.33	13.96	14.66
11.75	8.51	12.24	12.77	13.35	13.99	14.69
11.77	8.50	12.26	12.79	13.37	14.01	14.71
11.79	8.48	12.28	12.82	13.40	14.04	14.74
11.81	8.47	12.30	12.84	13.42	14.06	14.76
11.83	8.45	12.32	12.86	13.44	14.08	14.79
11.85	8.54	12.34	12.88	13.47	14.11	14.81

TEMPOSOFT Computing	
Calculating distance (*m.*)	100
Time benchmark (*sec.*)	11.67
Increment (*1/100 sec.*)	0.02
UM=second (*excel*)	1.15741E-05
Minimal time (*baseline*)	0.000694444

Table II

Grid illustration of effort intensity computing at 50 m. Range: 04 "40-06" 76 (calculated TEMPOSOFT by the program).

Maximal time	Speed (m/sec)	Effort intensity Running time equivalents (sec.)					Maximal time	Speed (m/sec)	Effort intensity Running time equivalents (sec.)				
100%		98%	96%	94%	92%	90%	100%		98%	96%	94%	92%	90%
04"40	11.36	04"49	04"58	04"68	04"78	04"89	05"68	8.80	05"80	05"92	06"04	06"17	06"31
04"42	11.31	04"51	04"60	04"70	04"80	04"91	05"70	8.77	05"82	05"94	06"06	06"20	06"33
04"44	11.26	04"53	04"63	04"72	04"83	04"93	05"72	8.74	05"84	05"96	06"09	06"22	06"36
04"46	11.21	04"55	04"65	04"74	04"85	04"96	05"74	8.71	05"86	05"98	06"11	06"24	06"38
04"48	11.16	04"57	04"67	04"77	04"87	04"98	05"76	8.68	05"88	06"00	06"13	06"26	06"40
04"50	11.11	04"59	04"69	04"79	04"89	05"00	05"78	8.65	05"90	06"02	06"15	06"28	06"42
04"52	11.06	04"61	04"71	04"81	04"91	05"02	05"80	8.62	05"92	06"04	06"17	06"30	06"44
04"54	11.01	04"63	04"73	04"83	04"93	05"04	05"82	8.59	05"94	06"06	06"19	06"33	06"47
04"56	10.96	04"65	04"75	04"85	04"96	05"07	05"84	8.56	05"96	06"08	06"21	06"35	06"49
04"58	10.92	04"67	04"77	04"87	04"98	05"09	05"86	8.53	05"98	06"10	06"23	06"37	06"51
04"60	10.87	04"69	04"79	04"89	05"00	05"11	05"88	8.50	06"00	06"12	06"26	06"39	06"53
04"62	10.82	04"71	04"81	04"91	05"02	05"13	05"90	8.47	06"02	06"15	06"28	06"41	06"56
04"64	10.78	04"73	04"83	04"94	05"04	05"16	05"92	8.45	06"04	06"17	06"30	06"43	06"58
04"66	10.73	04"76	04"85	04"96	05"07	05"18	05"94	8.42	06"06	06"19	06"32	06"46	06"60
04"68	10.68	04"78	04"87	04"98	05"09	05"20	05"96	8.39	06"08	06"21	06"34	06"48	06"62
04"70	10.64	04"80	04"90	05"00	05"11	05"22	05"98	8.36	06"10	06"23	06"36	06"50	06"64
04"72	10.59	04"82	04"92	05"02	05"13	05"24	06"00	8.33	06"12	06"25	06"38	06"52	06"67
04"74	10.55	04"84	04"94	05"04	05"15	05"27	06"02	8.31	06"14	06"27	06"40	06"54	06"69
04"76	10.50	04"86	04"96	05"06	05"17	05"29	06"04	8.28	06"16	06"29	06"43	06"57	06"71
04"78	10.46	04"88	04"98	05"09	05"20	05"31	06"06	8.25	06"18	06"31	06"45	06"59	06"73
04"80	10.42	04"90	05"00	05"11	05"22	05"33	06"08	8.22	06"20	06"33	06"47	06"61	06"76
04"82	10.37	04"92	05"02	05"13	05"24	05"36	06"10	8.20	06"22	06"35	06"49	06"63	06"78
04"84	10.33	04"94	05"04	05"15	05"26	05"38	06"12	8.17	06"24	06"37	06"51	06"65	06"80
04"86	10.29	04"96	05"06	05"17	05"28	05"40	06"14	8.14	06"27	06"40	06"53	06"67	06"82
04"88	10.25	04"98	05"08	05"19	05"30	05"42	06"16	8.12	06"29	06"42	06"55	06"70	06"84
04"90	10.20	05"00	05"10	05"21	05"33	05"44	06"18	8.09	06"31	06"44	06"57	06"72	06"87
04"92	10.16	05"02	05"12	05"23	05"35	05"47	06"20	8.06	06"33	06"46	06"60	06"74	06"89
04"94	10.12	05"04	05"15	05"26	05"37	05"49	06"22	8.04	06"35	06"48	06"62	06"76	06"91
04"96	10.08	05"06	05"17	05"28	05"39	05"51	06"24	8.01	06"37	06"50	06"64	06"78	06"93
04"98	10.04	05"08	05"19	05"30	05"41	05"53	06"26	7.99	06"39	06"52	06"66	06"80	06"96
05"00	10.00	05"10	05"21	05"32	05"43	05"56	06"28	7.96	06"41	06"54	06"68	06"83	06"98
05"02	9.96	05"12	05"23	05"34	05"46	05"58	06"30	7.94	06"43	06"56	06"70	06"85	07"00
05"04	9.92	05"14	05"25	05"36	05"48	05"60	06"32	7.91	06"45	06"58	06"72	06"87	07"02
05"06	9.88	05"16	05"27	05"38	05"50	05"62	06"34	7.89	06"47	06"60	06"74	06"89	07"04
05"08	9.84	05"18	05"29	05"40	05"52	05"64	06"36	7.86	06"49	06"62	06"77	06"91	07"07
05"10	9.80	05"20	05"31	05"43	05"54	05"67	06"38	7.84	06"51	06"65	06"79	06"93	07"09
05"12	9.77	05"22	05"33	05"45	05"57	05"69	06"40	7.81	06"53	06"67	06"81	06"96	07"11
05"14	9.73	05"24	05"35	05"47	05"59	05"71	06"42	7.79	06"55	06"69	06"83	06"98	07"13
05"16	9.69	05"27	05"37	05"49	05"61	05"73	06"44	7.76	06"57	06"71	06"85	07"00	07"16
05"18	9.65	05"29	05"40	05"51	05"63	05"76	06"46	7.74	06"59	06"73	06"87	07"02	07"18
05"20	9.62	05"31	05"42	05"53	05"65	05"78	06"48	7.72	06"61	06"75	06"89	07"04	07"20
05"40	9.26	05"51	05"63	05"74	05"87	06"00	06"50	7.69	06"63	06"77	06"91	07"07	07"22
05"42	9.23	05"53	05"65	05"77	05"89	06"02	06"52	7.67	06"65	06"79	06"94	07"09	07"24
05"44	9.19	05"55	05"67	05"79	05"91	06"04	06"54	7.65	06"67	06"81	06"96	07"11	07"27
05"46	9.16	05"57	05"69	05"81	05"93	06"07	06"56	7.62	06"69	06"83	06"98	07"13	07"29
05"48	9.12	05"59	05"71	05"83	05"96	06"09	06"58	7.60	06"71	06"85	07"00	07"15	07"31
05"50	9.09	05"61	05"73	05"85	05"98	06"11	06"60	7.58	06"73	06"87	07"02	07"17	07"33
05"52	9.06	05"63	05"75	05"87	06"00	06"13	06"62	7.55	06"76	06"90	07"04	07"20	07"36
05"54	9.03	05"65	05"77	05"89	06"02	06"16	06"64	7.53	06"78	06"92	07"06	07"22	07"38
05"56	8.99	05"67	05"79	05"91	06"04	06"18	06"66	7.51	06"80	06"94	07"09	07"24	07"40
05"58	8.96	05"69	05"81	05"94	06"07	06"20	06"68	7.49	06"82	06"96	07"11	07"26	07"42
05"60	8.93	05"71	05"83	05"96	06"09	06"22	06"70	7.46	06"84	06"98	07"13	07"28	07"44
05"62	8.90	05"73	05"85	05"98	06"11	06"24	06"72	7.44	06"86	07"00	07"15	07"30	07"47
05"64	8.87	05"76	05"88	06"00	06"13	06"27	06"74	7.42	06"88	07"02	07"17	07"33	07"49
05"66	8.83	05"78	05"90	06"02	06"15	06"29	06"76	7.40	06"90	07"04	07"19	07"35	07"51

Fig. 5 – Handheld Microgate Timing System used at UMF Tîrgu Mureş with three passing gates.

The program will instantly calculate the equivalent time requested by the coach. In order for the recorded data to be very objective, in addition to the minimum equipment (hand stopwatch and laptop or tablet with the installed executable program), it is advisable to have instrumentation with a photoelectric cell timer (i.e. *Microgate Timing System*). The minimal number of passing gates should be two (1, 2). The ideal number of passing gates depends on the number of required split times related to: sprint or long distance running, hurdling, long or triple jumping, swimming, other distances of displacement / locomotion, etc. (Fig. 5).

Domains, exemplifications and applicability of the TEMPOSOFT Program

a) *Applied sport disciplines and events*

Going through the literature, we noted an answer to the question: *Why does any athlete need a very good physical training in general, and a very good speed, in particular, regardless of the practiced sport discipline or sport event?* Thus, Letzerter quoted by Smirniotou argues that running speed over short distances is the fundamental quality because it provides any athlete with the ability "to quickly react (reaction rate), to be able to accelerate over a distance as long as possible (power), to reach a top-speed as high as possible (maximum velocity), to maintain it for as long as possible (maximum speed under resistance) and finally to minimize fatigue caused by the loss of velocity (speed under a submaximal resistance)" (Smirniotou et al., 2008). In addition, the effective management of speed training eliminates the occurrence of the phenomenon named "anaerobic energogenic substrate depletion" (McArdle et al., 2010). A top acceleration in running as high as possible can be achieved only with the activation of a considerable number of muscle motor units with maximum force executions "performed explosively and with the highest frequency" (Bompa & Carrera, 2006). A brief listing of sport disciplines and events that could be the beneficiaries of our proposed grids is presented in Table III.

b) *Determination of the individual rate of technicality (IRTh) in the hurdle race*

In hurdle running, the achieved time of the athlete is the result of his *topokinetic performances* (the individual reaction rate, the acceleration rate up to the first hurdle, the stepping rate for each hurdle, the lower limb strength impulse, the acceleration rate during the running range after the last hurdle up to finish line etc.). All these are supplemented by other individual *morphokinetic performances* (i.e. block starting technique, hurdle stepping technique, running technique up to the first hurdle and between hurdles, the overall rhythm of running

Table III

Illustrations of several sport disciplines and events as beneficiaries of grids utilization in running or other displacement computing tempos.

No.	Sport discipline	Targeted events or specific components of locomotion	Applicability and relevance in the context of specific requirements of the sport disciplines or events
1	Athletics	Speed running races Long distance running races Hurdle races (short and long distances) Long jump, triple jump, pole vault (the speed running approach) Javelin throw (the speed running approach)	Guiding the effort intensity on the development of running speed onset start and flying start sprint Identifying the deceleration areas throughout the entire running distance Setting up physical preparation in order to eliminate disturbing factors Developing the speed running approach in the context of the overall event requirements (speed acceleration, optimal speed on take-off phase, step running rhythm etc).
2	Rowing and kayak-canoeing	All competition events	Guiding the effort intensity for craft propulsion by setting of requested momentary times of displacement in relation to the objectives and requirements of the training period
3	Cycling	All competition events	Guiding the effort intensity in cycling by setting of requested momentary times of displacement in relation to the objectives and requirements of the training period
4	Swimming	All competition events	Guiding the effort intensity in swimming by setting of requested momentary times of displacement in relation to the objectives and requirements of the training period
5	Orientation in running	All competition events of orientation in running	Guiding the effort intensity in orientation in running by setting of requested momentary times of displacement in relation to the objectives and requirements of the training period
6	Speed skating	All competition events	Guiding the effort intensity in orientation in speed skating but also in off season physical training (running), by setting of requested momentary times of displacement in relation to the objectives and requirements of the training period
7	Nordic ski and biathlon	All competition events	Guiding the effort intensity in orientation in Nordic ski and biathlon but also in off season physical training (running), by setting of requested momentary times of displacement in relation to the objectives and requirements of the training period
8	Sport games	Especially physical training targeting the specific displacements on the playing field	Guiding the effort intensity in playing field displacement in technical and tactical context but also in non-specific physical training (i.e. sprints on short distances, uni- and multidirectional sprints, marker simulations and counterattack displacements etc.), by setting of requested momentary times of displacement in relation to the objectives and requirements of the training period

etc.). The main difficulty consists in the determination of contributory factors which lead to progress (i.e. a better personal running time). This is a problem encountered by any hurdle coach. By calculating the individual rate of technicality (IRTh), the contributory factor in achieving individual performance can be accurately determined. The formula is:

$$IRTh = (Thr-Tsr)/Nh$$

IRTh = individual rate of technicality; Thr = hurdle race time
Tsr = speed running time; Nh = number of hurdles

Thus, the analysis of the split time of each interval between the hurdles or the equivalent interval of the running speed can identify the possible moments of acceleration or deceleration, the stagnation or regression which limit the performance or other causes that produce individual progress/regress: higher /low speed running, very good / bad hurdle stepping technique etc. We illustrate below two analyzed cases of the 60 m hurdle race, based on the TEMPOSOFT data-program, measured by the *Microgate Timing System.*

1. 1st case (Fig. 6)

- 1st finding: the difference between the *hurdle running time* (Thr) and the *speed running time* (Tsr) *is too large*.
- 2nd finding: the *individual rate of technicality* (IRTh) is weak (low level - LL).
- priority target: substantial *optimization of the hurdle stepping technique*.
- secondary target: further development of overall individual running speed.

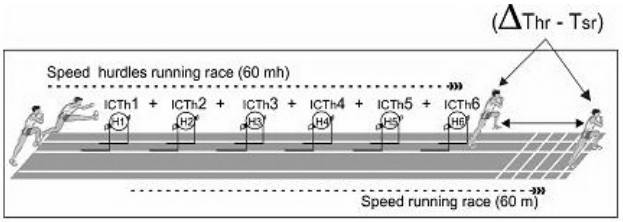


Fig. 6 – Low level of individual rate of technicality (LL-IRTh)
Note. This particular situation generates a large difference between the *speed running time* (Tsr) and the *hurdle race time* (Thr) with a modest performance in the hurdle race.

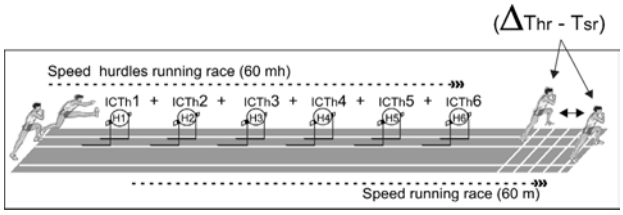


Fig. 7 – High level of individual rate of technicality (HL-IRTh).
Note. This particular situation generates a small difference between the *speed running time* (Tsr) and the *hurdle race time* (Thr) with a very good performance in the hurdle race.

2. 2nd case (Fig. 7)

- 1st finding: the difference between the *hurdle running time* (Thr) and the *speed running time* (Tsr) *is small*.
- 2nd finding: the *individual rate of technicality* (IRTh) is *at a high level* (high level - HL).
- priority target: *maintaining and improving the hurdle stepping technique.*
- secondary target: *further development of overall individual running speed.*

c) *The analysis of several race timelines in high performance athletes*

By analyzing the recorded patterns of several race timelines in world class performers (3), we can calculate adapted timelines for our own athletes, assessed by the proposed new TEMPOSOFT program. Therefore, the TEMPOSOFT program can become an effective work tool for each coach (Figs. 8, 9, 10).

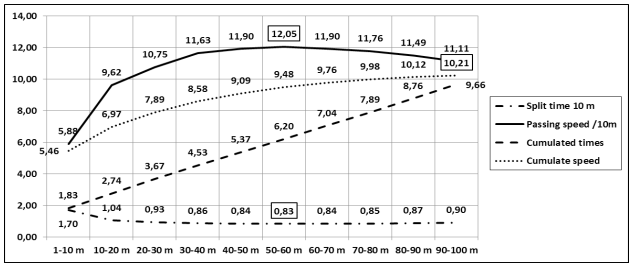


Fig. 8 – *Ben Johnson* timeline in the 100 m. running race - 1988 (Time = 9"79).

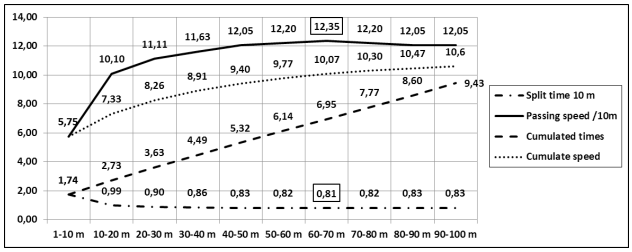


Fig. 9 – *Usain Bolt* timeline in the 100 m. running race - 2009 (Time = 9"58).

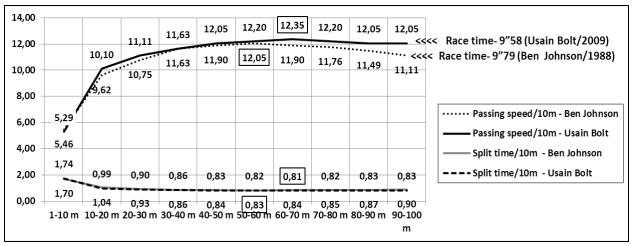


Fig. 10 – Comparative timelines between *Ben Johnson* (1988) and *Usain Bolt* (2009) in the 100 m. running race.

d) *Creation of a weighted rank matrix of motor skills pattern / sport event*

In the context of an objective contribution to the evaluation of each component of the ideal profile of an athlete related to a sport event requirement, we can develop a rank matrix pattern of skills, which can highlight only the valid and relevant score made by an athlete. Obviously, the contribution of the TEMPOSOFT program is in sport disciplines or events involving displacement movements. We present such a matrix pattern, inspired by Colibaba & Bota (1998) (Figs. 11, 12).

Specific motor skills	Task / Test	Individual rezult	Nominal rating	Skills ranking ratio						Weighted rating
				6	5	4	3	2	1	
Reaction rate	Reaction rate / auditory stimulus test	0"218	10	o						10
Repetition rate	„Tapping" Test / 6 sec.	68 rep.	10	o						10
Sprint	50 m sprint	7"3	8	o						8
Body weight / Lower limb force	Squat kgs. / body weight	1,4	10			o				6,66
Lower limb force	Standing long jump	2,28 m	10		o					8,33
Crunch	Trunk lifting / 30 sec.	38 sec.	9				o			4,50
Lombar mobility	Orthostatic lombar mobility test	Up to 15 cm	10			o				6,66
Specific mobility hurdle stepping	Maintaining a specific unsteady position with five inter-segmental right angles	Up to 40"	8	o						8
Specific endurance	300 m race	67"	7					o		2,33
General endurance	800 m race	2 min. 30"	5						o	0,83
TOTAL SCORE			Rated 87	4	1	1	2	1	1	Weighted 65,31

Fig. 11 – Theoretical matrix pattern of motor skills related to event requirements (i.e. 60 m hurdle race).

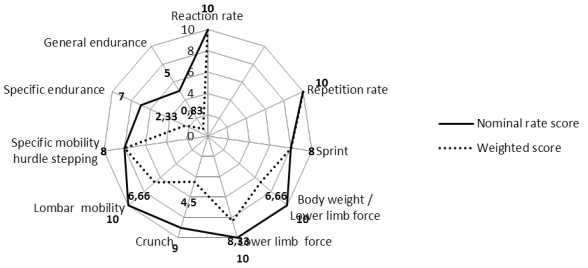


Fig. 12 – Graphical representation of the athlete's profile. The matrix pattern of motor skills related to hurdle race requirements – short distances.

Conclusions

1. The *individual coach* should be replaced by the so-called *coach team* (technical staff) - a comprehensive *team of specialists*: coach, physical trainer, physical therapist, nutritionist, psychotherapist, statistician (computer scientist), video operator, etc.

2. To have a well-founded and valid correlation with the athletes' momentary possibilities, a special exercise management based on a very accurate data base is required.

3. All these can be highlighted only using modern equipment and techniques, to quantify and evaluate in an extremely accurate manner the quantitative and qualitative exercise parameters - *volume, intensity and density*.

4. We propose and recommend the TEMPOSOFT program to be used in the training process in the case of more sports disciplines, but especially in those where the speed of movement (running or displacement) is a determinant or contributory factor of performance.

Conflicts of interest

Nothing to declare.

References

Aubert F. Approches athlétiques de la Préparation Physique. Colloque formation continue, Tours-Nord, 2002. Available online at: http://www.athle.fr/documents/ppg_tours.pdf. Accessed on 12.08.2014.

Aubert F. Les enjeux méthodologiques de la Préparation Physique (2). Sport, Santé et Preparation Physique, 2003;7:10-11.

Aubert F. Les enjeux méthodologiques de la Préparation Physique. INSEP, Département Formation, Paris, 2004.

Bompa TO, Carrera MC. Periodizarea antrenamentului sportiv. Planuri ştiinţifice pentru forţă şi condiţia fizică pentru 20 de discipline sportive. Ed. Tana, Bucureşti, 2006.

Bosquet L, Berryman N, Dupuy O. A comparison of 2 optical timing systems designed to measure flight time and contact time during jumping and hopping. J. Strength Cond. Res. 2009;23(9):2660-2665.

Casartelli N, Müller R, Maffiuletti N, Maffiuletti A. Validity and reliability of the myotest accelerometric system for the assessment. J Strength Cond Res. 2010;24(11):3186-3193.

Colibaba-Evuleţ D, Bota I. Jocuri sportive. Teorie şi metodică. Ed. Aldin, Bucureşti, 1998.

Glatthorn JF, Gouge S, Nussbaumer S, Stauffacher S, Impellizzeri FM, Maffiuletti NA. Validity and reliability of optojump photoelectric cells for estimating vertical. J.Strength Cond. Res; 2011;25(2)556-560.

Gréhaigne JF, Paul G. Dynamic Systems Theory and Team Sport Coaching. 2014;66(1):96-116. Available online at: http://dx.doi.org/10.1080/00336297.2013.814577. Accessed on 12.08.2014.

McArdle WD, Katch FI, Katch V. Exercise physiology. Nutrition, Energy and Human performance. Seventh Ed. Wolters Kluwwer/Lippinicott Williams & Wilkins. Philadelphia, 2010,233.

Neagu N. Cuantificarea pregătirii fizice în antrenamentul sportiv. Ed. University Press, Tîrgu Mureş, 2012.

Neagu N. Teoria şi practica activităţii motrice umane. Ed. University Press, Tîrgu Mureş, 2010.

Smirniotou A, Katsikas C, Paradisis G, Argeitaki P, Zacharogiannis E, Tziortzis S. Strength-power parameters as predictors of sprinting performance. J. Sports Med. Phys. Fitn. 2008;48(4):447- 454.

Web sites

(1) http://www.microgate.it/Timing/Products/Kit-Racetime2-Light-Radio/Description

(2) http://www.microgate.it/Timing-en/Professional-Timing-Systems

(3) http://speedendurance.com/2009/08/17/usain-bolt-splits-969-vs-958-can-he-run-faster/

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 207–213

A study on the amount of time students from the University of Bucharest allocate for sporting activities

Studiu privind bugetul de timp al studenţilor Universităţii din Bucureşti alocat activităţilor motrice de timp liber

Remus Dumitrescu, Daniela Aducovschi
Department of Physical Education and Sport, The University of Bucharest

Abstract

Background. The advancement of technology has determined a drastic change in the lifestyle of humans. The public have become more alert to the effect of an incorrect and disorganized alimentation. A sedentary lifestyle has been determined generally by an inappropriate education and by the temptations of modern technology (access to internet at home, different gadgets etc.). Knowing that the study program of the students is usually very full, we presumed that their free time is fairly limited arbitrarily by social circumstances and by the standard of living.

Aims. The study aimed to determine the amount of free time that the students of the University of Bucharest have, their principal activities and the importance of physical and sporting activities among them.

Methods. The method of the questionnaire. The questionnaire was answered by 2 groups of students: 110 from the Faculty of Physics, and 110 from the other 17 faculties of the University of Bucharest. The tasks of the study were as follows: the development of the questionnaire, the application of the questionnaire, the processing of data, and the wording of the work.

Results. The reasons of those who do not do sports in their free time is mostly because of the lack of time, the convenience of the facilities and social circumstances.

Conclusions. From the processed data, it is clear that the students who completed the questionnaire and who do sporting activities in their free time prefer to relax on their own or in a group. This suggests a lack of viable and attractive facilities with an organized infrastructure at an institutional or local administration level, or not being encouraged by their academic staff.

Keywords: students, budget of time, independent physical activity.

Rezumat

Premize. Avansul tehnologiei a dus la schimbarea dramatică a stilului de viaţă al oamenilor. Ritmul din ce în ce mai alert al activităţilor cotidiene are drept efect o alimentaţie incorectă şi dezorganizată. La polul opus se află sedentarismul, determinat în general de o educaţie necorespunzătoare şi de tentaţiile tehnologiei moderne (accesul la internet acasă/camin, diferite gadgeturi etc.). Ştiind că programul de studiu al studenţilor este destul de aglomerat, am presupus că aceştia au totuşi timp liber, dar destul de limitat în mod arbitrar de conjunctura socială şi nivelul de trai.

Obiective. Studiul de faţă şi-a propus să determine bugetul de timp liber al studenţilor Universităţii din Bucureşti, a principalelor activităţi recreative preferate şi ce pondere au activităţile fizice şi sportive în rândul acestora, ţinând cont de locaţia facultăţilor.

Metode. Metoda anchetei pe bază de chestionar. Experimentul s-a realizat pe două loturi reprezentative de studenţi: 110 din Facultatea de Fizică şi 110 din celelalte 17 facultăţi ale Universităţii din Bucureşti. Sarcinile cercetării au presupus: elaborarea chestionarului, aplicarea chestionarului, prelucrarea datelor, redactarea lucrării.

Rezultate. Motivaţia celor care nu fac sport în timpul liber se leagă în mare măsură de lipsa timpului, de comodidate, dar şi de conjunctura socială.

Concluzii. Din datele prelucrate reiese că subiecţii chestionaţi care practică activităţi sportive în timpul liber preferă să se relaxeze pe cont propriu, singuri sau în grup. Aceasta sugerează lipsa unor oferte viabile şi atractive într-un cadru organizat la nivel instituţional, al administraţiilor locale sau încurajării iniţiativelor cadrelor didactice.

Cuvinte cheie: studenţi, bugetul de timp, activitate fizica independentă.

Received: 2014, June 30; *Accepted for publication:* 2014, August 5;
Address for correspondence: University of Bucharest, Department of Physical Education and Sport. M. Kogălniceanu Av. No. 36-46, Sector 5, Bucharest
E-mail: remusdumitrescu@yahoo.com

Introduction

Nowadays society can be characterized by high work rhythms, which induce pressure that is sometimes difficult to counter by individuals who are incapable of adapting to these. The pressure imposed by time leads to the notion of time budget. Just like any other budget, this involves in principle a limited resource, which must be stingily managed (Bota, 2006).

"Compared to other leisure activities, sports leisure supposes an intense and sustained physical effort, even though it is not to be confounded with high performance sport activity. This represents an intermediate stage between a relaxed walk and sport in the traditional meaning..." (Stoicoviciu et al., 2012).

The aptitudes, knowledge and know-how necessary for independent sport activities are learnt during methodology and practice lessons. Then, the former are honed and developed through subjects approached in physical education classes and during leisure activities. Thus, the level, quantity and quality of the leisure activity stem from the quantity and quality of the educational-instructive matter amassed during physical education classes (Ganciu et al., 2010).

It is significant and specific that the necessity of social intervention in the individual evolution is something that society is aware of, and its achievement is organized, controlled in specific ways, depending on the degree and characteristics of each society's emancipation (Dumitrescu, 2013).

Many factors influence lifestyle considerably: motivation, ability and prior knowledge, home environment, teachers' expectations, media, personality and professional characteristics of teachers (Mirzajani et al., 2014).

Motivation for physical activity is not observed directly, but it can be inferred from one's behavior (Badri, 2002). However, according to social psychology, in addition to its individual layout, academic motivation has a broad social dimension, such as the environment, surroundings, parents, teachers, certain individuals and groups with which students can communicate in inducing the development and strengthening of academic motivation (Mirkazemi, 2003).

Yukseloglu & Karaguven (2013) studied academic motivation, aiming to identify the factors of efficiency in a group of students. The results showed that the group with common demographic characteristics and common majors had a higher efficiency on academic motivation. In turn, Haron et al. (2012) studied the effect on motivation and understanding and intellectual performance among students.

Onete et al. (2012) examined the relationship between academic motivation in the first year of training and the efficiency of education. Di Serio et al. (2013) identified four motivational aspects: trust, satisfaction, attention, and relevance.

Filsecker & Hickey (2014) investigated motivation among students, studies indicating a negative significance of reward methods that could be addressed in this new era of educational environments. According to Williams & Williams (2011), the five key factors that influence student motivation are content, environment, student, process / method and teacher.

Students spend a lot of time at home and their behavior and actions are greatly influenced by parents. The education level of the parents plays an important role in the successful education of young people. The results found by Krug (1989) and Forsyth & McMillan (1991) showed that academic factors are equally effective in motivating the students' academic orientation.

Hypothesis

Our students have a busy academic schedule, so we supposed that the spare time they have is mostly limited by education, social circumstances and the standard of living, but their interests include physical activities and sports.

Material and methods

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

Research protocol

a) *Period and place of the research*

The experiment was carried out during the academic year 2012-2013, and included two representative groups of students of the University of Bucharest.

b) *Subjects and groups*

- a group of 110 students in the 1st and 2nd year at the Physics University of Măgurele city, carrying out lessons of physical education and sport in the Măgurele sports facility – a multifunctional gym, a fitness gym, a soccer field – for 210 students.

- a group of 110 students in the 1st and 2nd year at the other 17 universities of UB, carrying out lessons of physical education in sport facilities in Bucharest – 4 gymnasiums, 3 tennis fields, 2 soccer fields, a multifunctional field – for 2189 students.

c) *Tests applied*

A questionnaire on the time students of the University of Bucharest spent with leisure activities. A questionnaire-based survey. The questionnaire was designed by the authors, with a total of 10 items, responses were closed, single or multiple.

d) *Statistical processing*

Statistical and mathematical method. Data were processed with Excel 2003, SPSS.v17, MINITAB.v16.

The study was motivated by the observation that in the University of Bucharest, students may not have a very great desire to practice physical activities in physical education classes. The range of disciplines is very wide, but they are increasingly less present in many sports activities. The curriculum requires a lot of work throughout the week and the students' answer was systematically the same "no time".

Two groups were investigated in totally different conditions:

- the group from Bucharest with multiple possibilities of spending the spare time and diverse options for sports;

- the group from Măgurele, isolated (10 km away from Bucharest), with limited options in general and concerning

sports.

By investigating the two groups with different situations, we wanted to discover the reasons of each group and to see if they coincided. By finding out each group's problems, we tried to identify solutions that we could use in order to determine more and more students to come to physical education classes and to practice sports in their spare time.

Table I

Questionnaire on the budget of time students of theUniversity of Bucharest spent with leisure activities.

No.	Items
1	How much available time do you have?
2	What type of activities do you prefer?
3	Do you practice sports activities in your free time?
4	How many times a week do you workout in your free time?
5	What type of sports do you prefer?
6	In wich setting do you prefer to practice sports?
7	If you do not workout in your free time, motivate why?
8	Do you have in the vicinity of the current activities location, spaces specially designed to carry out free time sporting activities?
9	Which are the reasons that determine you to practice sports activities?
10	Which are the reasons that determine you not to practice sports activities?

Results

1) How much time do you have available?

Chi-Square Tests	Value
Pearson Chi-Square	0.221
df	3
P (Asymp. Sig. (2-sided))	0.974
Phi Cramer's V	0.04

Between the two groups, there are no significant differences concerning the answers to question I1, significance threshold P (Asymp. Sig. (2-sided)) = 0.974 > 0.05, for a Chi-Square value = 0.221 and df (degrees of freedom) = 3. The size of the effect calculated with the phi Cramer coefficient = 0.04, according to Cohen, suggests a very weak association between the two groups when it comes to the answers to question I1.

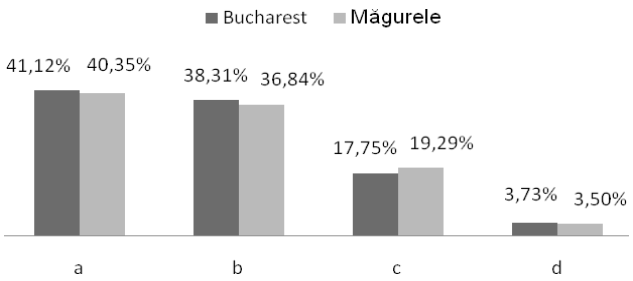


Fig. 1 – Free time.

2) What type of activities do you prefer?

Chi-Square Tests	Value
Pearson Chi-Square	4.603
df	6
P (Asymp. Sig. (2-sided))	0.596
Phi Cramer's V	0.11

Between the two groups of students, there are no significant differences concerning the answers to question I2, significance threshold P = 0.596 > 0.05, for a Chi-Square value = 4.603 and df (degrees of freedom) = 6. The size of the effect calculated with the phi Cramer coefficient = 0.11, according to Cohen, suggests a weak association between the two groups when it comes to the answers to question I2.

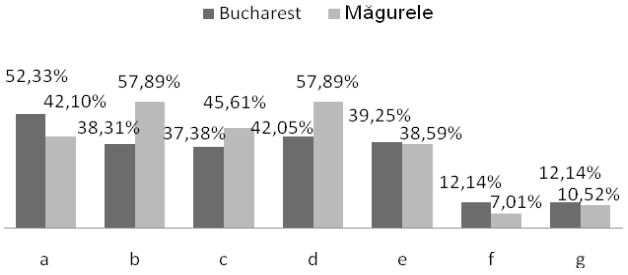


Fig. 2 – Preferences.

3) Do you practice sports activities in your free time?

Chi-Square Tests	Value
Pearson Chi-Square	0.094
df	1
P (Asymp. Sig. (2-sided))	0.759
Phi Cramer's V	0.02

Between the two groups, there are no significant differences concerning the answers to question I3, significance threshold P = 0.759 > 0.05, for a Chi-Square value = 0.094 and df (degrees of freedom) = 1. The size of the effect calculated with the phi Cramer coefficient = 0.02, according to Cohen, suggests a very weak association between the two groups when it comes to the answers to question I3.

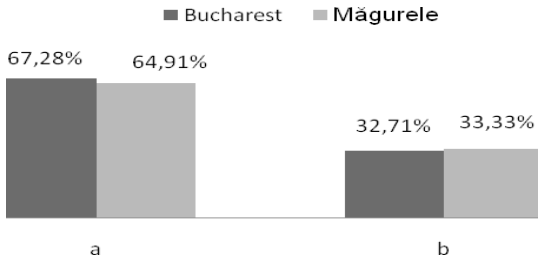


Fig. 3 – Free time sports.

4) How many times a week do you workout in your free time?

Chi-Square Tests	Value
Pearson Chi-Square	Value
df	3.548
P (Asymp. Sig. (2-sided))	4
Phi Cramer's V	0.471

Between the two groups, there are no significant differences concerning the answers to question I4, significance threshold P = 0.471 > 0.05, for a Chi-Square value = 3.548 and df (degrees of freedom) = 4. The size of the effect calculated with the phi Cramer coefficient = 0.15, according to Cohen, suggests a weak or medium association between the two groups when it comes to the answers to question I4.

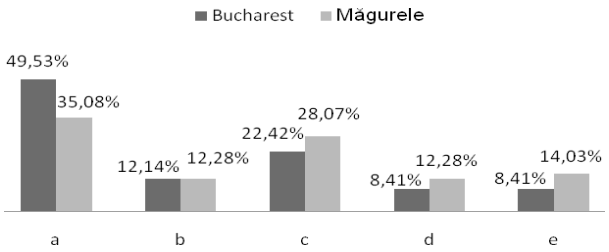


Fig. 4 – Frequency.

5) What type of sports do you prefer?

Chi-Square Tests	Value
Pearson Chi-Square	11.877
df	7
P (Asymp. Sig. (2-sided))	0.105
Phi Cramer's V	0.19

Between the two groups, there are no significant differences concerning the answers to question I5, significance threshold P = 0.105 > 0.05, for a Chi-Square value = 11.877 and df (degrees of freedom) = 7. The size of the effect calculated with the phi Cramer coefficient = 0.19, according to Cohen, suggests a weak or medium association between the two groups when it comes to the answers to question I5.

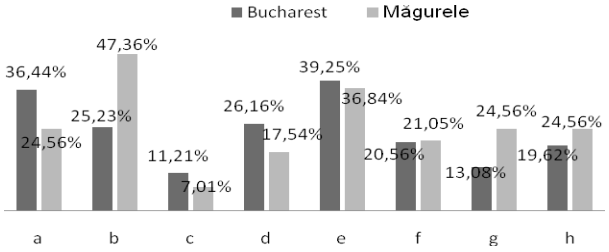


Fig. 5 – Sports.

6) In wich setting do you prefer to practice sports?

Chi-Square Tests	Value
Pearson Chi-Square	2.056
df	2
P (Asymp. Sig. (2-sided))	0.358
Phi Cramer's V	0.10

Between the two groups, there are no significant differences concerning the answers to question I6, significance threshold P = 0.358 > 0.05, for a Chi-Square value = 2.056 and df (degrees of freedom) = 2. The size of the effect calculated with the phi Cramer coefficient = 0.10, according to Cohen, suggests a weak association between the two groups when it comes to the answers to question I6.

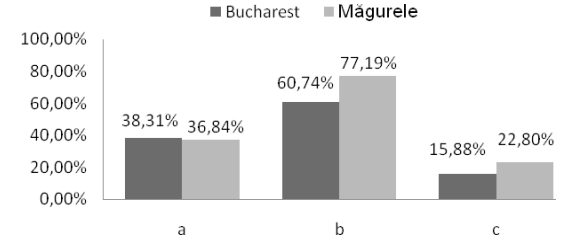


Fig. 6 – Where/with whom?

7) If you do not workout in your free time, motivate why?

Chi-Square Tests	Value
Pearson Chi-Square	5.240
df	4
P (Asymp. Sig. (2-sided))	0.264
Phi Cramer's V	0.21

Between the two groups, there are no significant differences concerning the answers to question I7, significance threshold P = 0.264 > 0.05, for a Chi-Square value = 5.240 and df (degrees of freedom) = 4. The size of the effect calculated with the phi Cramer coefficient = 0.21, according to Cohen, suggests a weak association between the two groups when it comes to the answers to question I7.

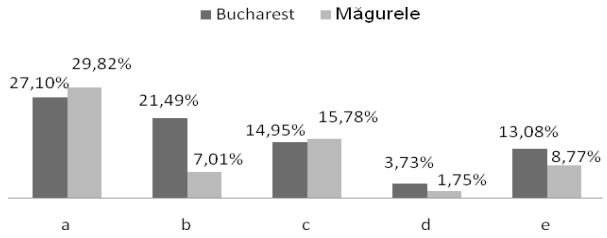


Fig. 7 – Why not?

8) Do you have in the vicinity of the current activities location, spaces specially designed to carry out free time sporting activities ?

Chi-Square Tests	Value
Pearson Chi-Square	2.472
df	1
P (Asymp. Sig. (2-sided))	0.116
Phi Cramer's V	0.12

Between the two groups, there are no significant differences concerning the answers to question I8, significance threshold P = 0.116 > 0.05, for a Chi-Square value = 2.472 and df (degrees of freedom) = 1. The size of the effect calculated with the phi Cramer coefficient = 0.12, according to Cohen, suggests a weak association between the two groups when it comes to the answers to question I8.

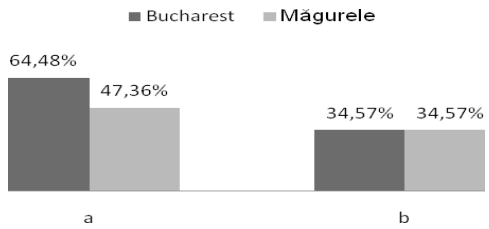


Fig. 8 – Opportunities.

9) Which are the reasons that determine you to practice sports activities?

Chi-Square Tests	Value
Pearson Chi-Square	3.192
df	4
P (Asymp. Sig. (2-sided))	0.526
Phi Cramer's V	0.14

Between the two groups, there are no significant differences concerning the answers to question I9, significance threshold P = 0.526 > 0.05, for a Chi-Square value = 3.192 and df (degrees of freedom) = 4. The size of the effect calculated with the phi Cramer coefficient = 0.14, according to Cohen, suggests a weak association between the two groups when it comes to the answers to question I9.

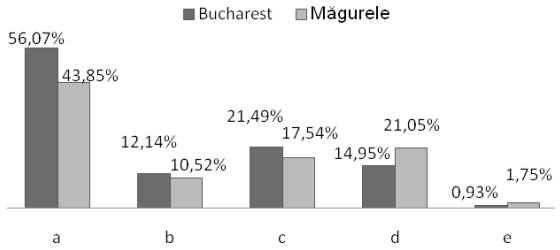


Fig. 9 – "Pro" sport reasons.

10) Which are the reasons that determine you not to practice sports activities?

Chi-Square Tests	Value
Pearson Chi-Square	8.963
df	4
P (Asymp. Sig. (2-sided))	0.062
Phi Cramer's V	0.26

Between the two groups, there are no significant differences concerning the answers to question I10, significance threshold P = 0.062 > 0.05, for a Chi-Square value = 8.963 and df (degrees of freedom) = 4. The size of the effect calculated with the phi Cramer coefficient = 0.26, according to Cohen, suggests a medium association between the two groups when it comes to the answers to question I10.

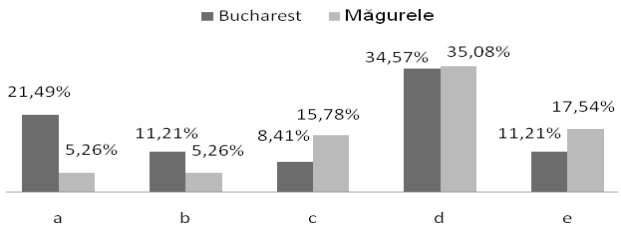


Fig. 10 – Inconveniences.

Comparative statistical analysis between the two experimental groups

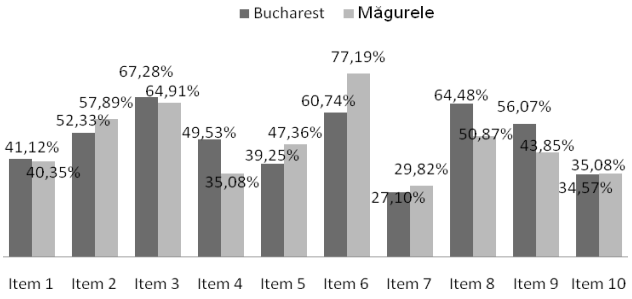


Fig. 11 – Dominant option in the two experimental groups for each item.

Discussions

All the items reveal no significant differences between the two groups, significance threshold P = 0.nnn > 0.05.

Free time. The question "How much time do you have available?", was most frequently answered by the students from Bucharest "between 3-4 hours per day", 41.12%, followed by the answer "between 1-2 hours per day", 38.31%. A percentage of 17.75% answered that they had "more than 4 hours per day" of spare time. Also, we identified a very small percentage of 3.73% who declared that they had no spare time.

At the Faculty of Physics from Măgurele (Magurele Campus), the answers highlighted that 40.35% of the students had "between 3-4 hours per day" free time, 36.84% "between 1-2 hours per day", 19.29% "more than 4 hours per day" and 3.50% had "no spare time".

Summed up, the two answers (a and b) from each sample cover 77% of the responses, which allows us to observe that most of the participants had spare time between 1 and 4 hours per day.

Preference. Regarding the question „What type of leisure activities do you prefer?", there were more answers than cases due to the possibility of multiple answers (up to 6).

According to the percentage distribution: 52.33% preferred spending time in front of the TV/computer, 42.05% opted for nature recreation, 39.25% preferred reading, 38.31% preferred physical activities, 37.38% chose to go to movies/plays/concerts, 12.14% opted for going to clubs or other. The top preference confirms a sedentary trend.

Regarding the Măgurele Campus, 57.89% of the students preferred physical activities, close to those choosing nature recreation. These were followed by those going to movies/plays/concerts, 45.61%, while the proportion of TV/computer users was 42.10%, and of those who preferred reading was 38.59%. Only 7.01% opted for going to clubs! 10.52% were represented by other options, showing an interest in other activities.

Free time sports. The question "Do you practice sports activities in your free time?" was answered by 67.28% of the students from Bucharest with "yes" and by 32.71% with "no". This suggests that in spite of the low time budget, most of the students were aware of the necessity of physical exercise for a healthy lifestyle. 64.91% of the students from Măgurele answered "yes" and 33.33% admitted that they did not exercise.

Frequency. The most common answer to the question "How many times a week do you workout in your free time?" when it came to the students from Bucharest was "occasionally", 49.53% of them choosing this answer, while 22.42% chose "twice a week" and 12.14% "once a week". The last two options, "three times" and "more than three times" were chosen by 8.41% of the participants.

At Măgurele, 35.08% of the participants answered "occasionally", 28.07% "twice a week", 14.03% "more than three times a week", 12.28% "once a week" and 12.28% "three times a week".

Sports. The question "What sports do you prefer?" was most frequently answered by the students in Bucharest

with "jogging", 32.25%, followed by "aerobics/fitness/bodybuilding", 36.44%; 26.16% preferred skateboard/skating/cycling, 25.23% preferred team sports, 20.56% enjoyed swimming, 19.62% chose "other", 13.08% liked tennis and 11.21% chose ice-skating/snowboard/skiing, which indicates a large variety of the students' options.

In Măgurele, the first preference was team sports chosen by 47.36%, followed by jogging, 36.84%, aerobics/fitness/bodybuilding, tennis and "other" chosen by 24.56%, skateboard/skating/cycling, 17.54%, and winter sports ice-skating/snowboard/ski chosen by just 7.01%. The students' opinions were diversified but, unfortunately, their financial situation did not allow them to really act on their preferences.

Where/with whom? For the question "In which setting do you prefer to practice sports?" we noticed that the participants from Bucharest mostly chose the option "in social groups", 60.74%, followed by "independent", 38.31%, and "in an organized way at a gym or a sports club", chosen by 15.88%.

In Măgurele, 77.19% of the students preferred to practice sports "in social groups", 36.84% chose "independent" and 22.80% liked to practice sports "in an organized way at a gym or a sports club".

Why not? The most frequent answer to the question "Why don't you workout in your free time?" when it came to the students from Bucharest was "I don't have enough time" chosen by 27.10% of them, followed by "convenience", 21.49%, "I don't have where/with whom" by 14.95%, "other" by 13.08% and "I'm not interested" chosen by 3.73%.

The students from Măgurele answered with "I don't have enough time", 29.82%, "I don't have where/with whom", 15.78%, "other", 8.77%, followed by "convenience", 7.01% and "I'm not interested", 1.75%.

Opportunities. The answers to this question were full of eloquence regarding the lack of concern of local authorities to create specially designated places for leisure activities.

Of the Măgurele campus respondents, 50.87% reported they had a nearby location to which they could go for physical leisure activities, while 47.36% said they did not. In the Bucharest campus, 64.48% answered they had such a space close by, while 34.57% said they did not.

„Pro" sport reasons. The answers for the Bucharest campus were as follows: a significant percent of 56.07 students were motivated by education received in the family, 21.49% believed that variety was stimulating, 14.95% had the advantage of a close location to a sport facility, 12.14% considered the sport facility to be satisfactory. Only 0.93% believed that local authorities had done their job sufficiently in promoting physical activities.

The Măgurele campus was represented by 43.85% of students who were motivated by education received in the family, 21.05% had the advantage of a close location to a sport facility, 17.54% found variety stimulating, 10.52% believed the sport facility was satisfactory, while only 1.75% believed that local authorities had done their job sufficiently in promoting physical activities.

Inconveniences. Those who do not want to practice leisure physical activities give different reasons in the two situations: In the Bucharest campus, 34.57% blame the distance and the lack of time to cover it, 21.49% feel the lack of a mentor is the reason, while 11.21% blame the sport facility for not catering to their needs, and others claim that the standards and efforts of local authorities are not enough to motivate them to partake in physical activities. A proportion of 8.41% is represented by those who claim they do not have sufficient variety in their choices.

In the Măgurele campus, 35.08% blame the distance and the lack of time to cover it, 17.54% accuse local authorities, 15.78% say they lack sufficient choices. 5.26% say they need a mentor and the same percent accuse the lack of a proper sport facility.

Discussions with the students revealed a lack of attractive offers and sustainable university, local government or private support initiatives.

The proportion of subjects reporting to have free time between 1 and 4 hours was 90% in both samples. Those who answered that they had very little free time were represented by less than 3%, and at the other extreme, those having more than 4 hours free time did not exceed 7%. The most popular activities of free time were TV/internet/internet movies and sports activities.

In the preferences of the students' free time, physical activities and sports ranked second, after „TV shows/movies on the internet/activities on the Internet", being preferred before „shows/movies/concerts" and „other kinds of recreation".

Based on the two samples from different campuses, it was found that each area had its problems and therefore students had different disadvantageous situations in both cases. The Bucharest campus has several offers but it takes time to reach those spaces, which is often a reason to quit. In the Magurele campus, at the Faculty of Physics, things are different in the sense that there is a sport facility nearby but poorly equipped, and the local government does not provide any free time activities for this social segment.

Conclusions

1. Both groups have spare time.
2. Both groups prefer spending their spare time mainly by doing sports, recreational outdoor activities and watching tv/movies/using the internet.
3. Practicing sports is occasional for most of the students.

Proposals

1. For both campuses, the development of sports, by investing in the construction of modern sports halls and courts is required.
2. Local governments must develop projects in order to accommodate the needs for free time spending.
3. Physical education teachers should be encouraged and supported in organizing special events designed to further stimulate the students' willingness to practice free time activities becoming a lifestyle.

Conflicts of interests
There are no conflicts of interest.

References

Badri M. Application of Psychology in the School. Tehran Soroush Publications, Congress Code: 2002, 2K7M/ 1051 LB.

Bota A. Physical exercices for a working life-Driving activities for leisure time. Publisher University Book, Bucharest, 2006,11-13.

Di Serio Á, Ibáñez MB, Kloos CD. Impact of an augmented reality system on students' motivation for a visual art course. Computers & Education, 2013;68:586-596.

Dumitrescu R. Activităţi sportive montane şi nautice. Ed. Univ. din Bucureşti, 2013,69.

Filsecker M, Hickey DT. A multilevel analysis of the effects of external rewards on elementary students' motivation, engagement and learning in an educational game. Computers & Education, 2014;75:136-148.

Forsyth DR, McMillan JH. Practical proposals for motivating students. New directions for teaching and learning, 1991; 45:53-65.

Ganciu M (coord), Aducovschi D, Gozu B, Stoica A et al. Activitatea fizică independentă şi valorificarea prin mişcare a timpului liber. Vol. I, Ed. Univ. din Bucureşti, 2010,39-40.

Haron HNH, Shaharoun AM, Puteh M, Harun H. Does Motivation Affect Students' Understanding and Performance in Engineering Statics ? Procedia-Social and Behavioral Sciences, 2012;56:191-203.

Mirzajani H, Rahimisadegh Z, Alami R, Farnia M, Bayekolaei MD. The Effective Factors on the Guidance School Students' Academic Motive. Res. J. Recent Sci. 2014;3(6),77-82.

Krug SE. Leadership and learning: A measurement-based approach for analyzing school effectiveness and developing effective school leaders. In: Maehr ML, Ames C. Advances in motivation and achievement:Motivation enhancing environments. Greenwich: JAI Press Inc. 1989;6:248-274.

Mirkazemi N. Community's reaction field theory. Effective practices in student motivation. J. Educ. Ministry Ed., 2003.

Onete OU, Edet PB, Udey FU, Ogbor BP. Academic Performance: A Function of Achievement Motivation among Education Students of Cross River University of Technology, Calabar. Review of Higher Education in Africa, 2012;4:63-83.

Stoicoviciu A (coord.), Dumitrescu R, Leştaru M, Sakizlian R et al. Activitatea fizică independentă şi valorificarea prin mişcare a timpului liber. Vol. II, Ed. Univ. din Bucureşti, 2012, 10.

Williams KC, Williams CC. Five key ingredients for improving student motivation. Res. Hig. Ed. J, 2011;12:1-23.

Yukseloglu SM, Karaguven MH. Academic Motivation Levels of Technical High School Students. Procedia-Social and Behavioral Sciences, 2013;106:282-288.

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 214–218

The importance of rehabilitation treatment of ankle traumas in athletes

Importanţa tratamentului de recuperare în patologia traumatică a gleznei la sportivi

Simona Szasz[1], Nicolae Neagu[1], Horaţiu Popoviciu[1], Octav Russu[1], Horaţiu Moldovan[1], Mirela Parvu[1], Eniko Gabriela Papp [2]
[1] *University of Medicine and Pharmacy, Târgu Mureş*
[2] *School Centre for Inclusive Education No. 2, Târgu Mureş*

Abstract

Background. Anatomically, the ankle and the foot form an anatomical and functional structure with the role of supporting body weight, maintaining orthostatism and performing walking.

Aims. The aim of this study was to highlight the importance of rehabilitation treatment in athletes diagnosed with trauma to the ankle. Monitoring of these patients was performed using pain assessment scores, assessing the quality of life, and performing functional clinical assessments.

Methods. The study was conducted on 60 athletes with mild and moderate ankle sprains. Patient selection was done in the Department of Rheumatology and Rehabilitation and in the Department of Orthopaedics, Mureş County Emergency Hospital from January 2013 - December 2013. Two groups of 30 patients each were studied. Patients in group C were only recommended rest, compression bandages, pain relievers and anti-inflammatory treatment, while patients in group E were recommended complex rehabilitation treatment procedures over a period of 14 sessions. Patients were evaluated initially, at the end of the treatment, two weeks after, and at an interval of 3 months using the visual analogue scale (VAS), clinical assessment, and joint testing.

Results. No statistically significant improvement was found in group C patients in terms of pain and joint mobility, while in group E a statistically significant improvement was found regarding the patients' pain assessed by VAS and mobility of the joint assessed by joint testing. Joint swelling was encountered in 70% of patients in group C 2 weeks after the traumatic event and in 40% of patients 3 months after. Only 25% of the patients in group E showed joint swelling 2 weeks after the injury, and only 10% after 3 months.

Conclusions. Our study shows that recovery treatment significantly alleviates pain and improves mobility in athletes with ankle traumas, maintaining positive effects in the long run.

Keywords: rehabilitation treatment, trauma to the ankle, athletes.

Rezumat

Premize. Glezna, ca structură anatomică, formează un tot unitar împreună cu piciorul, alcătuind o structură anatomofuncţională cu rol de susţinere a greutăţii corpului, de menţinere a ortostatismului şi de efectuare a mersului.

Obiective. Scopul acestui studiu a fost evidenţierea importanţei tratamentului de recuperare la pacienţii cu activitate sportivă diagnosticaţi cu traumatisme la nivelul gleznei, la care monitorizarea evoluţiei în timp s-a făcut utilizând scoruri de evaluare a durerii, a calităţii vieţii şi evaluări clinico-funcţionale.

Metode. Studiul a fost realizat pe pe un număr de 60 de sportivi cu entorse uşoare şi medii. Selecţia pacienţilor s-a făcut din Secţia de Reumatologie şi Recuperare şi Secţia de Ortopedie a Spitalului Clinic Judeţean de Urgenţă Mureş pe perioada ianuarie 2013-decembrie 2013. S-au luat în studiu două loturi de câte 30 de pacienţi. Pacienţilor din lotul C li s-a recomandat doar repaus, compresie cu bandaj elastic, tratament antiinflamator şi antialgic, în timp ce pacienţilor din lotul E li s-a recomandat un tratament complex de recuperare, pe o durată de 14 şedinţe. Evaluarea pacienţilor s-a făcut iniţial, la sfârşitul tratamentului, după două săptămâni şi la un interval de 3 luni, utilizând scala VAS (visual analog scale), evaluarea clinică a pacienţilor şi testingul articular.

Rezultate. În lotul C de pacienţi nu s-a constat o ameliorare statistic semnificativă în ceea ce priveşte durerea şi mobilitatea articulară, în timp ce în lotul E, s-a constat o amelioarare statistic semnificativă a durerii apreciată prin scala VAS (visual analog scale) şi a mobilităţii articulare evaluată prin testingul articular. Tumefierea articulară s-a menţinut în lotul C la 70% dintre pacienţi după evenimentul traumatic la 2 săptămâni şi la 40% dintre pacienţi la 3 luni. La pacienţii din lotul E, doar 25% mai prezentau tumefiere articulară la 2 săptămâni după traumatismul sportiv, în timp ce la 3 luni doar 10%.

Concluzii. Studiul nostru dovedeşte că prin tratamentul de recuperare se ameliorează semnificativ atât durerea, cât şi mobilitatea la sportivii cu patologie traumatică la nivelul gleznei, cu menţinerea acestor efecte pe termen lung.

Cuvinte cheie: tratament de recuperare, traumatisme gleznă, sportivi.

Received: 2014, August 13; *Accepted for publication:* 2014, September 2;
Address for correspondence: University of Medicine and Pharmacy, Târgu Mureş, Gheorghe Marinescu Str. No. 38, 540139, România
E-mail: szasz_fc@yahoo.com

Introduction

The ankle and the foot form an anatomical and functional complex that supports body weight, with a static and dynamic role, and they are involved in orthostatism, propulsion and lifting of the body. The ankle joint is formed by the fibula, tibia and astragalus. The foot is an anatomical structure composed of metatarsal bones, tarsal bones, three cuboid bones, cuneiform, navicular bones, calcaneus and talus. The foot movements are dorsiflexion, plantar flexion, while the subtalar joint allows for flexion, extension, abduction, adduction and rotation. These combined movements allow for foot pronation and supination. Pronation results by combining 3 movements: dorsiflexion, eversion and abduction; on the other hand, supination involves plantar flexion, inversion and adduction. Eversion occurs around a long axis with anterior-posterior orientation, the foot is turned outward, while inversion is around the same axis, but the foot is turned inward. Abduction occurs around a vertical axis, moving the foot in lateral direction (Sbenghe, 2002).

The talocrural joint is formed by the superior surface of the talus and the inferior extremities of the tibia and fibula. The joining elements are represented by the articular capsule, the lateral collateral ligament consisting of 3 fascicles: anterior talofibular, posterior, calcaneofibular, medial collateral ligament.

Foot movements are performed by different joints: in tibial torsion the joint associated with a small participation of the subastragalar joint achieves flexion and extension, the subastragalar joint and medial torsion perform inversion and reversion, in the same joint with a small participation of medial torsion, abduction and adduction are initiated.

Medial torsion and the tarsometatarsal joint have an important role in the elasticity of the foot. Foot muscles are extrinsic and intrinsic. Extrinsic muscles have the most important role in the dynamics and statics of the foot and include the triceps surae, anterior and posterior tibial muscles, finger flexors and extensors. The triceps surae is a plantar flexor of the foot and stabilizer and it is most active when the foot is lifted on the toe. The soleus muscle is more important in ankle mobilization than the gastrocnemius and very sensitive to the stretch reflex.

The medial side of the soleus is active in inversion, with an important role in foot mobilization and stabilization. The lateral side of the soleus is active in eversion and stabilization rather than in the mobilization of the ankle. Anterior tibial and finger extensors are involved in foot dorsiflexion. The anterior tibial muscle is contracted during the balance phase. Peroneal muscles are active in plantar flexion and inactive in dorsiflexion. Peroneal muscles are active in plantar flexion and inactive in dorsiflexion. The posterior tibial muscle helps with plantar flexion and inversion, with the ankle in plantar flexion. Intrinsic muscles are involved in various foot movements, especially in stabilizing the foot during propulsion and their action is on the subtalar and transverse tarsal joint (Sbenghe, 1987). The most common cause of ankle sprains, especially lateral sprains, is forced plantar flexion and ankle inversion (Chan et al., 2011).

Traumatic injuries of the ankle include contusions, sprains, dislocations, fractures that can affect all anatomical structures: skin, ligaments, tendons, vascular-nervous and muscular structures. Clinical assessments are: pain, swelling, tenderness, decrease of mobility, stability, straightening and balance.

Mild and moderate sprains occur with the ankle in inversion or eversion and the foot in plantar flexion, while severe sprains involve ligaments tearing, changing of the articular surface rate, without losing this rate (Popescu & Florea, 2008).

Sprain diagnosis is made based on symptoms, clinical signs and imaging investigationd. Grading a sprain is difficult because symptoms and clinical signs are common: pain, functional impotence, edema, sometimes ecchymosis that pleads for severe sprain. Ultrasonography plays an important role in sprain diagnosis, it evidences the interruption of continuity or disinsertion of the ligament. During rest, the linear and continuous aspect remains the same, but a small liquid collection may persist (Fodor, 2009).

It is important to treat correctly sprains in order to prevent complications: frequent relapse, instability, chronic pain and early onset of arthrosis. Mild and moderate sprains consist of ligament stretch, with no modification in continuity and resistance.

The most common sprain is inversion sprain that affects the external lateral ligament and shifts the astragalus away from the external malleolus. Passive inversion and eversion are possible. Eversion sprains are rare, affect the internal lateral ligament and sometimes the inferior peroneal tibial, and induce the diastase of the internal side of the astragalus from the internal malleolus.

Foot sprains are often confused with tenosynovitis and can affect various joints: subastragalar, medial tarsal, tarsometatarsal, metatarsophalangeal, and considering their low mobility, they are in general mild sprains (Sbenghe, 1981).

Treatment of mild and moderate sprains involves pain control, restoration of muscular balance, ROM and bone stability. Patients must be advised to avoid activities that can increase swelling and pain and to rest in order to facilitate early recovery. The ankle should be elevated above the heart level.

Most of ankle sprains do not necessitate cast immobilization, medical devices may be used for 4-21 days (Fongemie 2006). Velcro ankle associated with taping increases bone stability. Prophylactic semi-rigid ankle braces reduce the incidence of ankle sprains as well as recurrences for those involved in sports with a high risk for sprains (Gross & Liu, 2003).

Hyaluronic acid intra-articular infiltration represents a relatively new approach in non-surgical ankle sprains and can facilitate earlier return to sports activities (Seah & Mani-Babu, 2010).

Treatment must be complex based on analgesics, anti-inflammatory drugs, myorelaxants, postural rest, hydrotherapy, electrotherapy, massage, kinetotherapy, cryotherapy, bracing, MgSO4 compresses, local infiltration, thermotherapy such as alternative baths.

Massage has an antalgic and venous lymphatic drainage role in fighting edema in the abdominal and proximal

extremity of the thigh and on sole level in order to facilitate venous lymphatic return. For tendons and ligaments, Cyriax massage is recommended.

Electrotherapy has an antalgic, anti-inflammatory and muscle relaxant role and consists of the application of electric current.

TENS (transcutaneous electrical nerve stimulation) has an antalgic effect due to the release of endorphins and increases steroid and serotonin levels. Serotonin plays an important role in muscle spasm relief and depression (LiBrach, 1988).

In our study, it was applied twice per day for 20 min before and after meals. Transcutaneous electrical nerve stimulation (TENS) represents one of the most used forms of electro-analgesia. It is the election method in the treatment of ankle trauma injuries.

The mechanism of analgesia produced by TENS is explained by the gate-control theory inhibiting constant nociceptive transmission via C fibers, when painful peripheral stimulation occurs, the information carried by C fibres reaches the T cells and opens the gate which is usually closed, so the pain is transmitted to the thalamus and cortex, then the gate is closed again, preventing further central impulses in the activated myelinated fibres.

The closure of gates for the transmission of nociception through A delta and C fibers prevents pain from reaching the brain (Fernandez-Del-Olmo, et al., 2008; Liebano et al., 2013; Woolf & Thompson, 1994).

The galvanic current has the property of determining thermal effects, physiological and chemical effects. Passing through humans produces molecular dissociation. Iontophoresis (ionization) is used in order to make therapeutic substances penetrate through the skin. At the anode, it produces analgesia on receptors, sensitive fibers, it releases endorphins, and has a muscle relaxant effect. At the cathode, it produces vasodilatation by blocking vasomotor nerve transmission and by relaxing smooth vascular muscles. It rises local temperature by 2-3 degrees and releases histamine and also produces mastocyte degranulation (Rădulescu, 2004).

Ultrasonography has very good analgesic effects by inhibiting nociceptive receptors and also, anti-inflammatory, muscle relaxing, fibrolytic effects and performs a micro-massage on tissue. Ultrasound is commonly used for treating acute ankle sprains due to its anti-inflammatory and soft tissue healing effects by increasing the temperature (Rădulescu, 2004).

As soon as the rehabilitation program starts, the athlete returns to play. Prevention of recurrences depends on the type of activity performed by patients. Sports such as football, volleyball or basketball increase the risk for relapse (Fong et al., 2007; Curtis et al., 2008; Fong et al., 2008; Ivins, 2006). Some studies show that asymmetry in muscle testing of ankle flexors associated with overweight and a high body mass index increases the risk of sprains in football players (Fousekis et al., 2012).

Objectives

The aim of this study was to highlight the importance of rehabilitation treatment in patients diagnosed with ankle sprain; assessment of these patients was done using pain assessment scores, quality of life and functional clinical assessments.

We observed an amelioration of pain, joint mobility and tibial torsion joint swelling in both groups diagnosed with mild and moderate ankle sprains.

Hypothesis

We considered a significant amelioration of pain and mobility in the group that received recovery treatment compared to the other group to which no recovery treatment was applied.

Material and methods

The study was elaborated with the respect of all current deontological rules, obtaining the approval of the Ethics Committee and the patient informed consent.

Research protocol

a) *Period and place of the research*

The study was conducted on a group of 60 athletes with mild and moderate ankle sprains suffered during sport competitions or while training. The patients were selected in the Rheumatology and Rehabilitation Department and the Orthopaedics Department of the Clinical County Emergency Hospital Targu-Mures in the period January 2013-December 2013.

b) *Subjects and groups*

The patients were divided in two groups of 30 patients each: group C and group E. Age ranges varied between 18-25 for a number of 25 patients, while for 35 patients age range was between 25-35. There were 38 female patients and 22 male patients, all from urban areas.

For the patients of group C, we recommended only postural rest, anti-gravitational position of the injured ankle, elastic bandage, pain and anti-inflammatory treatment, while for group E we applied a complex rehabilitation program in 14 sessions. These patients received the same treatment as patients from group C, but associated with a rehabilitation program consisting of contrasting hydrotherapy, lymphatic drainage massage, electrotherapy, kinetotherapy.

c) *Tests applied*

Patient assessment was made initially, at the end of treatment, after 2 weeks and 3 months of follow-up using VAS (visual analogue scale), clinical assessment and articular testing. VAS assesses pain intensity from 0 to 10, where 0 means no pain and 10 represents the maximum of pain described by the patient within the last 48 hours.

d) *Statistical processing*

For data analyses, we used the SPSS statistical calculation program.

Results

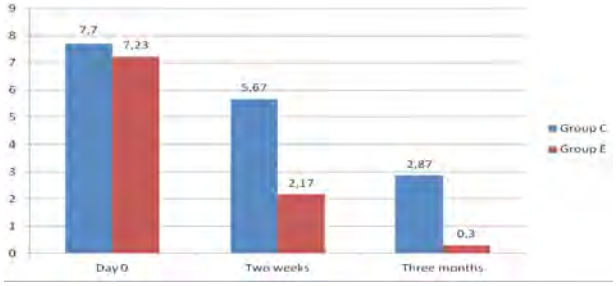


Fig. 1 – Pain amelioration in patients of both groups using the VAS scale.

We applied the VAS scale and muscular testing to both groups at baseline, 2 weeks after the completion of treatment in group E and after 3 months (Fig. 1).

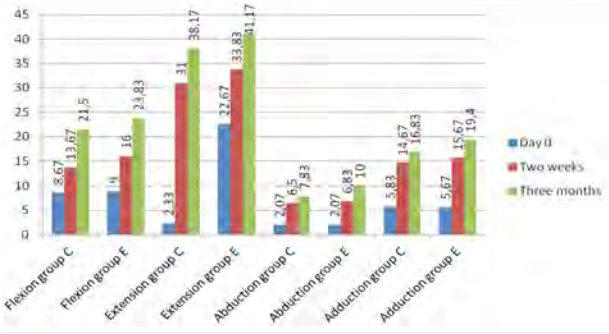


Fig. 2 – Functional assessment using joint testing.

In group, C we did not find a statistically significant improvement of pain and mobility, while in group B we obtained a statistically significant improvement graded using the VAS scale and also, an improvement of joint mobility evaluated by articular testing (Fig. 2).

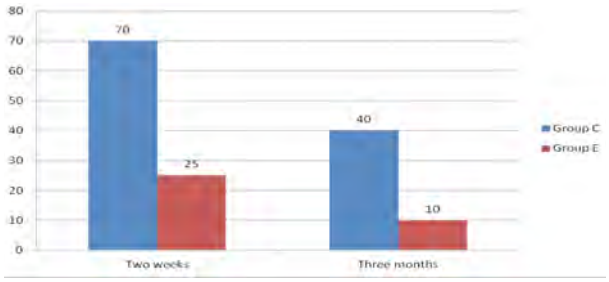


Fig. 3 – Persistence of joint swelling.

Mild joint swelling was maintained in 70% of the patients of group A 2 weeks after the trauma injury, and in 40% of patients it occurred intermittently due to overloading at 3 months follow-up. In group B only 25% presented joint swelling after 2 weeks from trauma and only 10% at 3 months follow-up (Fig. 3).

Discussions

Ice packing was applied during the first days, 4 times per day for 15 min, and contrasting hydrothermal therapy was applied initially, after 2 days from the trauma injury. We used alternative baths 2-3 times per day.

Electrotherapy included the relief of pain and anti-inflammatory procedures, TENS, ultrasonography with NSAID gel, laser therapy, ion galvanization with MgSO4. The procedures were performed daily for 14 days.

The main objectives of the rehabilitation program were: pain relief, restoration of mobility and bone stability, as well as muscle balance training. The restoration of muscle balance targets the whole body and requires muscle strengthening, regaining of motor control, coordination and feedback. Strengthening exercises based on isometric exercises, with resistance or progressive loading were aimed at the surae triceps, the anterior, posterior tibial, extensor and common flexor fingers, lateral fibula, flexor hallux, short flexor of sole. The restoration of motion included exercises for the stability of the contralateral limb, open kinetic chain exercises from decubitus, knee position, orthostatic position and walking. In coordination restoration, an important role was played by occupational therapy based on pedalling, rolling boards, easy jumping, various walking exercises. To increase ROM, patients performed passive mobilization, stretching and active mobilization. Some theories suggest that an exercise program based on balance and coordination training may have both local and central effects on the sensory-motor system and can promote neuromuscular improvements in the prevention and rehabilitation of ankle injuries.

Impaired neuromuscular control and its effects represent delaying factors in the rehabilitation program (Dundas et al., 2014). The rehabilitation program had 3 phases: phase I based on improving the range of motion, pain control, gait training and fighting inflammation. Phase II was characterized by improving strength, flexibility, increasing the range of motion and cardiac adaptation and also, facilitating proprioception. Phase II objectives: restoration of the prior level of function (Fongemie, 2006).

Conclusions

1. Our study demonstrates that a complex rehabilitation program ameliorates pain and mobility in athletes with ankle trauma injury, with effects in the long run.
2. Joint swelling occurs due to mechanical overloading and is more frequent in patients with no recovery treatment.
3. Rehabilitation treatment increases the chances for a quick recovery and resumption of sports activities for athletes.
4. The rehabilitation program prevents short and long-term complications.

Conflicts of interests

There are no conflicts of interest.

References

Chan KW, Ding BC, Mroczek KJ. Acute and chronic lateral ankle instability in the athlete. Bull NYU Hosp Jt Dis 2011;69(1):17-26.

Curtis CK, Laudner KG, McLoda TA, McCaw ST. The role of shoe design in ankle sprain rates among collegiate basketball players. J Athl Train. 2008;43(3):230-233.

Dundas MA, Gutierrez GM, Pozzi F. Neuromuscular control during stepping down in continuous gait in individuals with and without ankle instability, J Sports Sci, 2014;32:(10):926-933.

Fernandez-Del-Olmo M, Alvarez-Sauco M, Koch G, et al. How repeatable are the physiological effects of TENS? Clin Neurophysiol. 2008;119(8):1834-1839

Fodor D. Ecografie clinică musculoscheletală. Ed. Medicală, Bucureşti, 2009, 44

Fong DT, Hong Y, Chan LK, Yung PS, Chan KM. A systematic review on ankle injury and ankle sprain in sports. Sports Med. 2007;37(1):73-94.

Fong DT, Man CY, Yung PS, Cheung SY, Chan KM. Sport-related ankle injuries attending an accident and emergency department. Injury. 2008;39(10):1222-1227.

Fongemie A. Health Care Guideline: Ankle Sprain, 7th ed. Bloomington, 2006, 1-25.

Fousekis K, Tsepis E, Vagenas G. Intrinsic risk factors of noncontact ankle sprains in soccer: a prospective study on 100 professional players. Am J Sports Med. 2012;40(8):1842-1850.

Gross MT, Liu HY. The role of ankle bracing for prevention of ankle sprain injuries. J Orth. Sports Physio-Ther. 2003; 33(10):572-577.

Ivins D. Acute ankle sprain: an update. Am. Fam. Physsi. 2006; 74(10):1714-1720.

LiBrach SL. The use of transcutaneous electrical nerve stimulation for the relief of pain in palliative care. J Palliat Med 1988; 2:15-20.

Liebano RE, Vance CG, Rakel BA, Lee JE, Cooper NA, Marchand S, et al. Transcutaneous electrical nerve stimulation and conditioned pain modulation influence the perception of pain in humans. Eur J Pain. 2013; 17(10):1539-1546.

Popescu R, Florea M. Recuperarea în ortopedie. Ed. Medicală Universitară. Craiova, 2008, 269-270.

Rădulescu A. Electroterapie ed. a II-a, Ed. Medicală, Bucureşti, 2004, 130,162,260-264.

Sbenghe T. Kinesiologie - ştiinţa mişcării. Ed. Medicală. Bucureşti, 2002, 285-294.

Sbenghe T. Kinetologie profilactică, terapeutică şi de recuperare. Ed. Medicală, Bucureşti, 1987, 384-386.

Sbenghe T. Recuperarea medicală a sechelelor posttraumatice ale membrelor. Ed. Medicală, Bucureşti, 1981, 386-391.

Seah R, Mani-Babu S. Managing ankle sprains in primary care: what is best practice? A systematic review of the last 10 years of evidence. Br Med. Bull, 2011;97:105-135.

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 219–222

Aspects regarding the investigation of single-leg balance in athletes
Aspecte privind investigarea echilibrului pe un picior la sportivi

Simona-Pia Făgăraş[1], Cristina-Elena Moraru[2], Liliana-Elisabeta Radu[2]
[1] *"Petru Maior" University, Târgu Mureş*
[2] *Faculty of Physical Education and Sport, "Al. I. Cuza" University, Iaşi*

Abstract

Background. Body balance is an important factor for a good motricity in static and dynamic activities.

Aims. The aim of the study was to analyze one-leg balance on the preferred leg in athletes with eyes open and closed.

Methods. The study was carried out on 20 subjects aged between 10-13 years old. Ten of them practiced gymnastics and the other 10, fencing. With the digital program GPS 5.0, the computer registered and assessed the following variables of balance: mediolateral displacement of the center of mass, anterior posterior displacement of the center of mass, frequency of oscillations in frontal and sagittal plane. Statistical analyses were conducted using SPSS 20.0 software for Windows and were expressed as mean and standard deviation, and the parametric t test was used for the differences of the means. The independent samples t test was used to find out whether there were any balance differences in the dominant leg between gymnasts and fencers.

Results. The results revealed a value of $p<0.05$ for mediolateral displacement and the frequency of oscillations in frontal plane. In addition, the paired t test was used to compare the scores obtained in two different conditions (with eyes open and closed) in each group. In the group of gymnasts no significant differences were obtained for the variables of balance and the fencers' group showed statistical differences for two variables: mediolateral displacement of the center of mass and frequency of oscillations in frontal plane.

Conclusions. The differences found in mediolateral displacement may be related to lower limb and hip strength depending on the sport practiced.

Keywords: balance, oscillations, center of mass, gymnastics, fencing.

Rezumat

Premize. Capacitatea de echilibru a corpului este o condiţie indispensabilă motricităţii, atât pentru activităţile statice, cât şi pentru cele dinamice.

Obiective. Studiul îşi propune să analizeze echilibrul pe piciorul preferat la sportivi, atât cu ochii deschişi, cât şi cu ochii închişi.

Metode. Cercetarea s-a realizat pe un număr de 20 de subiecţi, cu vârsta cuprinsă între 10-13 ani. Dintre aceştia 10 subiecţi practică gimnastică, iar 10 scrimă. Cu ajutorul programului digital GPS 5.0 s-au înregistrat şi evaluat următoarele variabile: deplasarea mediolaterală şi anteroposterioară a centrului de presiune, precum şi frecvenţa oscilaţiilor în plan frontal şi sagital. Pentru calculul statistic am utilizat programul SPSS 20.0 pentru Windows, iar datele au fost reprezentate ca medie şi deviaţie standard, pe baza cărora s-au aplicat testele t parametrice de comparare a mediilor. Testul t pentru eşantioane independente a fost aplicat pentru a verifica dacă există diferenţe semnificative în ceea ce priveşte echilibrul pe piciorul dominant între gimnaşti şi scrimeri.

Rezultate. Rezultatele au relevat valori ale lui $p<0,05$ pentru variabilele: deplasarea mediolaterală a centrului de presiune şi frecvenţa oscilaţiilor în plan frontal. De asemenea, am comparat scorurile obţinute în condiţii diferite (cu ochii închişi şi cu ochii deschişi) la fiecare grupă de subiecţi, utilizând testul t pentru eşantioane perechi. La grupa gimnaştilor nu s-au constatat diferenţe semnificative la nici una dintre variabilele echilibrului, iar la grupa scrimerilor diferenţele au fost semnificative pentru 2 variabile: deplasarea mediolaterală a centrului de presiune şi frecvenţa oscilaţiilor în plan frontal.

Concluzii. Diferenţele obţinute la deplasarea centrului de presiune în plan frontal pot fi rezultatul dezvoltării diferite a musculaturii membrului inferior şi a bazinului, în concordanţă cu specificul sportului practicat.

Cuvinte cheie: echilibru, oscilaţii, centru de presiune, gimnastică, scrimă.

Received: 2014, June 27; *Accepted for publication:* 2014, August 10;
Address for correspondence: "Petru Maior" University, Nicolae Iorga Street, no.1, Târgu Mureş
E-mail: monihaba@yahoo.com

Introduction

The diversity of approaches to defining balance comes from the field of expertise and the domain of the person who debates this issue; each specialist tries to explain as clearly as possible the aspects describing this capability. Hence, in the opinion of certain authors, balance is defined as the state of a body submitted to forces that cancel each other without changing its state – moving or quiet; others present it as an availability response, a specific feeling for the right movement, a motor skill (Marcu, 2000; Hotz, 2003). The notion of postural balance – analyzed from a physiological perspective – is defined as the dynamic of mechanical tensions in the agonist and antagonist muscles, commanded voluntarily or automatically and controlled by at least five feedback loops (Creţu et al., 2007). From the perspective of biomechanics, balance refers to internal forces generated by muscle contraction, while, in kinesiotherapy, balance is defined as the maintenance of the body's gravitation line within the support polygon (Gagea, 2006; Sbenghe, 1999). From the perspective of physical education and sport, the concept of balance is presented as the capacity of maintaining the body in a balanced position and of restoring its balance following displacements or wide-range strain (Manno, 1992).

The fundamental elements that interfere with the capacity of controlling body balance are as follows: stability of support surface, localization of the center of gravity, limit of stability, size of support surface, capacity of visualizing the environment, motor activities approached by the individual, integrity and interaction between mechanisms of postural control. Hence, body balance can be impaired or even lost in situations when the limit values of any of the aforementioned elements are exceeded (Marcu & Chiriac, 2009).

Balance is one of the basic physical qualities in the athlete's movements, irrespective of the sport; if the player is to lose his/her balance abilities, he/she consequently loses his accuracy of performing the skill (El-Maaty, 2010). Postural changes are distinct depending on the activity, and each sport has its own postural adjustments. For instance, in combat sports practices, the focus is on somatosensory information, while gymnastics is based on visual information (Filingeri et al., 2012).

The development of elegance and beauty in gymnastics movements depends on the level of certain motor skills such as flexibility, which plays an important role in this sport, considering that it is necessary for the execution of wide range movements (Karloch et al., 2012). The manner of executing these elements depends very much on postural balance, necessary for the accuracy of movements (Poliszczuk & Broda, 2012). Because rhythmic gymnastics comprises numerous elements associated with launching and catching apparatus, athletes must find original perceptive and motor solutions (Geoffroy et al., 2008).

Speed has developed very much and it has become what is known today as "conversation through the blade" (Sowerby, 2012). Fencing is a rapid sport from all perspectives: speed of perception, speed of reaction, speed of motion, rapid action change, rapid change of rhythm, rebalancing speed. Fencing develops many coordinative capacities, which can be divided intro three groups, as follows: motor educability, motor control and motor adaptability. From this standpoint, fencing is very different from other sports that involve similar motor skills, such as gymnastics, acrobatic gymnastics, etc. (Czajkowski, 2005). Fencing is characterized by dynamism, which involves both analyzing the trajectory of the weapon and managing the dynamic balance based on continual movements within speed attacks, which force the athletes to adapt constantly from a spatial, temporal and situational perspective. The fencer faces a double constraint: he/she must react to the opponent and regain balance during attacks and counterattacks (Herpin et al., 2010).

Hypothesis

If the athlete practices one particular sport, during sports training, the specificity of the sport influences balance on the preferred leg. Hence, this paper aims at analyzing body balance on the preferred leg in beginners aged between 10 and 13 years – practitioners of gymnastics and fencing – and to pinpoint the differences arising in two different conditions: eyes open and eyes closed.

Material and methods

Research protocol

a) *Period and place of the research*

The investigation was conducted in September-November 2013 and it comprised two stages, at the Medical Recovery Center within the Arcadia Hospital Iaşi. We mention that, in agreement with the Declaration of Helsinki, the Amsterdam Protocol and Directive 86/609/EEC, all study procedures were approved by an ethics commission within the Faculty of Physical Education and Sport concerning investigation on human subjects, and that we obtained the written consent of the subjects and of their parents.

Subjects and groups

The research sample comprised 20 subjects, aged between 10 and 13 years. Of these, 10 subjects were gymnasts, while 10 were fencers and they had been practicing this sport for 1-3 years.

b) *Tests applied*

Balance on the preferred leg with the help of the GPS 400 Stabilometric Platform, which shows the situation in real time and can detect minor changes in the subjects' ability to maintain balance.

Each subject was asked to maintain position on the preferred leg, arms close to the body, palms facing the body and the other leg knee flexed for 30 seconds or as much as he/she could without exceeding this time duration. If a subject maintained position for less than 30 seconds, then he/she was allowed to try again (but no more than three attempts), and the computer registered the best result. The tests took place in two different conditions: eyes open and eyes closed.

By using the GPS 5.0 software, we registered and assessed the following variables: mediolateral and anterior posterior displacement of the center of mass (units) and frequency of oscillations in frontal and sagittal plane (Hz).

c) *Statistical processing*

For statistical calculations, we used SPSS 20.0 for Windows, and results were expressed as mean and standard

deviation, and the parametric t test for the differences of the means. The independent samples t test was used to find out whether there were any balance differences in the dominant leg between gymnasts and fencers.

Results

For the test of balance on the preferred leg (Table I), gymnasts featured a lower frontal deviation of the General Center of Mass (GCM) compared to fencers (3.86±4.23 units vs. 28.20±11.60 units), while sagittal deviation was lower among fencers compared to gymnasts (3.26±15.37 units vs. 14.50±9.14 units). Concerning the frequency of oscillations in the two planes, gymnasts had a higher deviation compared to fencers.

Table I
Balance on the preferred leg with eyes open.

Parameters	Eyes open			
	Gymnastics (N=10)		Fencing (N=10)	
	Mean	SD	Mean	SD
GCM projection in frontal plane	3.68	±4.23	28.20	±11.60
GCM projection in sagittal plane	14.50	±9.14	3.26	±15.37
Frequency of GCM oscillations in frontal plane	0.41	±0.32	0.28	±0.21
Frequency of GCM oscillations in sagittal plane	0.29	±0.21	0.17	±0.38

Table II
Balance on the preferred leg with eyes closed .

Parameters	Eyes closed			
	Gymnastics (N=10)		Fencing (N=10)	
	Mean	SD	Mean	SD
GCM projection in frontal plane	4.23	±3.37	10.94	±16.48
GCM projection in sagittal plane	16.15	±13,32	7.43	±22.17
Frequency of GCM oscillations in frontal plane	0.63	±0.36	0.25	±0.14
Frequency of GCM oscillations in sagittal plane	0.23	±0.12	0.25	±0.09

As for balance on the preferred leg with eyes closed (Table II), we recorded the same deviations of the GCM: lower in frontal plane in gymnasts, while lower in sagittal plane in fencers. In regard to the frequency of oscillations, in frontal plane they were higher by 0.63±0.36 Hz in gymnasts compared to fencers, who scored a mean of 0.25±0.09 Hz, while in sagittal plane, the frequency of oscillations had a mean of 0.23±0.12 Hz in gymnasts, lower than the one of the fencing group (0.25±0.09 Hz).

After analyzing the balance on the preferred leg in gymnasts (Table III), we found no significant differences between the two tested situations (eyes open and eyes closed), while fencers had significant differences for GCM in frontal plane and for the frequency of oscillations in sagittal plane (Table IV).

Table III
Statistical differences between balance with eyes open and eyes closed in gymnasts.

Parameters	Mean diff.	t	p
GCM projection in frontal plane	0.55	-0/481	>0.05
GCM projection in sagittal plane	1.65	-0.611	>0.05
Frequency of GCM oscillations in frontal plane	0.21	-1.284	>0.05
Frequency of GCM oscillations in sagittal plane	0.06	0.731	>0.05

Table IV
Statistical differences between balance with eyes open and eyes closed in fencers.

Parameters	Mean diff.	t	p
GCM projection in frontal plane	17.26	2.708	00.05
GCM projection in sagittal plane	4.17	-0.489	>0.05
Frequency of GCM oscillations in frontal plane	0.02	0.297	>0.05
Frequency of GCM oscillations in sagittal plane	0.06	-2.280	<0.05

Discussions

Previous research has shown the existence of complex factors, where perception and action play a crucial role in the control of body posture (Smart et al., 2004; Gautier et al., 2008). Maintaining balance and spatial orientation are necessary in performance sports and they refer to the body's ability of maintaining the center of gravity within the support base (Cordun, 2009; Duarte & Freitas, 2010). Maintaining balance through the mechanism of postural control leads to small, but constant oscillations of the body while standing, which plays a very important role in distributing the weight on the soles (Viera & Oliveira, 2006; Shigaki et al., 2013). However, other studies support the idea that superior balance is the result of training the ability to respond to relevant proprioceptive and visual signals (Ashton-Miller et al. 2001).

The originality and novelty of our investigation reside in the fact that we focused on investigating balance on the preferred leg in two different individual sports. Findings evidenced similarities between balance on the preferred leg with eyes open and closed in gymnasts, and no statistically significant differences were found. Our findings are similar to others, which showed no significant differences on the level of frequency of oscillations in the two planes (Tookuni et al, 2005).

In fencers, significant differences were found in GCM projection in frontal plane with eyes open/closed, and in the frequency of oscillations in sagittal plane. It is worth noting that for balance with eyes closed, subjects had much better balance than with eyes open (28.20 units – eyes open vs. 10.94 units – eyes closed). In fencers, the significantly better results in balance with eyes closed can be explained by the fact that visual information is not very much used for balance control, but rather for reading the opponent's intentions (Gautier et al., 2008). Fencing is a unique sport, which reflects an asymmetrical development of muscles. Maintaining one-leg balance requires force and increased focusing capacity, in direct connection with other receptors at the level of auditory and visual analyzers and at the level of muscles and joints (Tzolakis & Tziganos, 2008).

One-leg support is one of the most unstable balance stances, due both to the support (very small compared to the body weight) and to the external and internal forces that manifest their vectors in different directions.

By eliminating the visual analyzer (closing the eyes), instability increases and it cannot be controlled for long; the final result is the loss of balance. Furthermore, reducing the body's points of contact with the support surface in the one-leg stance not only limits the support surface, but also

increases segment force, as an effect of the increase in muscle and ligament tension and in pressure on the sole. The consequence is the increase in the floor's reaction forces, which disturbs the state of balance (Alexe, 2009).

Certain limitations can be considered for this study: we had a too small number of subjects to provide for a characteristic of the population studied; considering the age of the subjects, sport did not have the time to put a mark on early specialization, mostly in fencing; the technique of the two sports is different; the groups comprised both boys and girls; the tests were conducted only on the preferred leg. Starting from these limitations, our future intention is to conduct similar investigations, in order for these findings to help the specialists in practice.

Conclusions

The investigation demonstrated that at this age, gymnasts have better balance on the preferred leg compared to fencers, while fencers have better balance in frontal plane with eyes closed than with eyes open.

Concerning the frequency of oscillations, it is higher in frontal plane compared to the sagittal plane, and this goes for both groups of subjects.

Conflicts of interests

There were no conflicts of interests.

Acknowledgments

This work was supported by the strategic grant "Integrated system for improving the doctoral and postdoctoral research quality in Romania and for promoting the role of science in society", POSDRU/159/1.5/S/133652, co-funded by the European Social Fund through the Sectoral Operational Programme Human Resources Development 2007-2013.

References

Alexe DI. Manifestarea echilibrului la pubertate în funcţie de dominanţa emisferelor cerebrale, în vederea orientării în probe tehnice de atletism. Doctoral thesis, National University of Physical Education and Sport, Bucharest, 2009, 76.

Ashton-Miller JA. Thoracic hyperkyphosis in the young athlete: a review of the biomechanical issues. Curr Sports Med Rep, 2004;3(1):47-52.

Cordun M. Kinantropometrie. Ed. CD Press, Bucharest, 2009, 209.

Creţu A, Tiron C, Gagea A, Gherghel C, Păunescu M, Neacşu C, Cordun M, Ispas C, Bota C, Tudor V, Negulescu I, Predescu C, Predescu R, Berteanu C, Berteanu M, Tiron S. Contribuţii la evaluarea stabilităţii posturale şi a echilibrului dinamic în unele disfuncţii neurologice, normalitate sau performanţa umană. Tradiţie şi perspectivă în educaţie fizică şi sport. Ed. Printech, Bucharest, 2007, 3.

Czajkowski Z. Understanding fencing. The unity of theory and practice. SKA Swordplay Books, USA, 2005, 26-29.

Duarte M, Freitas SMSF. Revisao sobre posturografia baseada em platforma de forca para acaliacao do equilibro. Rev. Bras. Fisioter. 2010;14(3):183-192.

Filingeri D, Bianco A, Zangla D, Paoli A, Palma A. Is karate effective in improving postural control? Sc. Mart. Arts 2012;8(4):191-194. Gagea A. Biomecanică analitică. Ed. ANEFS, Bucharest, 2006.

Gautier G, Thouvarecq R, Vuillerme N. Postural control and perceptive configuration: influence of expertise in gymnastics. Gait & Posture, 2008;28:46-51.

Herpin G, Gauchard GC, Lion A, Collet P, Perrin PP. Sensorimotor specificities in balance control of expert fencers and pistol shooters. J Electromyo. Kinesiol, 2010;20:162-169.

Hotz A. Un thème omniprésent à tout âge. Mobile (La Revue d'éducation physique et de sport), 2003; (1):8-8.

El-Maaty HRAA. A training programme for developing motor response and balance and its effect on lunging accuracy of fencing juniors. World J Sport Sci, 2010;3(S):584-587.

Karloch M, Santos RP, Kraeski MH, Sousa Matias T, Kraeski D, Menezes FS. Alongamento estatico versus conceito Mulligan: aplicacoes no treino de flexibilidade em ginastas. Fisioter Mov 2012;23:523-533.

Manno R. Bazele teoretice ale antrenamentului sportiv. Ed. EPS în SDP nr. 371-374, Bucharest, 1996.

Marcu F. Marele dicţionar de neologisme, Ed. Saeculum, Bucharest, 2000.

Marcu V, Chiriac M. Evaluarea în cultură fizică şi sport. Ed. Univ. Oradea, 2009.

Poliszczuk T, Broda T. Somatic constitution and the ability to maintain dynamics body equilibrium in girls practicing rhythmic gymnastics. Pediatr. Endocrinol. Diabetes Metab. 2012;16:94-99.

Sbenghe T. Bazele teoretice şi practice ale kinetoterapiei. Ed. Medicală, Bucharest, 1999, 262.

Shigaki L, Rabello RM, Camargo MZ, Costa Silva VB, Oliveira Gil AW, Oliveira MR, Oliveira RM, Silva Junior RA, Souza Guerino Macedo C. Comparative analysis of one-foot balance in rhythmic gymnastics athletes 2013;19(2):104-107.

Smart LJ, Mobley BS, Otten OW, Smith DL, Amin MR. Not just standing there: The use of postural coordination to aid visual tasks. Human Movement Science, 2004;22(6):769-780.

Sowerby A. Fencing-Skills. Tactics. Trening. Crowood Press Ltd, UK, 2012, 8.

Tookuni KS, Neto RB, Pereira CAM, Souza DR, Greve JMD, Ayala AD. Analise comparativa do controle postural de individuos com e sem lesao do ligamento cruzado anterior do joelho. Acta Ortop Bras 2005;13:115-119.

Tsolakis C, Tsiganos G. The influence of training on neuromuscular factors in elite and non elite fencers. Serb J Sports Sci 2008;2(1-4):59-65.

Viera TMM, Oliveira LM. Equilibrio postural de atletas remadores. Rev Bras Med Esporte 2006;12 (3): 135-138.

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 223–226

A study regarding the effects of personalized and individualized nutritional intervention in the case of a patient suffering from morbid obesity

Studiu privind efectele intervenţiei nutriţionale individuale personalizate în cazul unui pacient cu obezitate morbidă

Laura Ioana Biriş[1], Lorena Filip[2], Doina Miere[2]
[1] *Iuliu Haţieganu University of Medicine and Pharmacy, Cluj-Napoca*
[2] *Department of Bromatology, Hygiene, Nutrition, Iuliu Haţieganu University of Medicine and Pharmacy, Cluj-Napoca*

Abstract

Background. Obesity and overweight are considered to be a real global epidemic, having a major contribution in increasing the incidence of certain pathologies representing the main causes of death around the world. Personalized and individualized nutritional intervention based on lifestyle changes (diet, behavior, physical activity) is the basic component in the management of overweight and obesity.

Aims. The aim of the present study was to evaluate the evolution of the anthropometrics measurements and the body composition of a patient suffering from morbid obesity, following an intervention determining lifestyle changes.

Methods. Anthropometrics and body composition measurements were performed at the beginning of the nutritional intervention, during each monitoring session (n=6) and at the end of the intervention, as well as after 12 months from the end of the intervention. The initial evaluation as well as the monitoring sessions took place under the supervision and coordination of a registered dietician.

Results. The present study highlighted clinically significant reduction in weight, body mass index (BMI), total fat mass, abdominal fat and waist circumference, after the applied nutritional intervention.

Conclusions. The present study demonstrated the fact that personalized and individualized nutritional intervention represented a useful strategy in the management of morbid obesity in the case of the patient included in the study.

Keywords: morbid obesity, personalized and individualized nutritional intervention, body composition.

Rezumat

Premize. Obezitatea şi supraponderea reprezintă o adevărată epidemie la nivel mondial, contribuind major la creşterea incidenţei unor patologii, care alcătuiesc principalele cauze de deces la nivel mondial. Intervenţia nutriţională individuală şi personalizată, bazată pe modificări ale stilului de viaţă (dietă, comportament, activitate fizică), reprezintă pilonii fundamentali în managementul supraponderii şi obezităţii.

Obiective. Prezentul studiu a avut ca scop urmărirea evoluţiei parametrilor antropometrici şi ai compoziţiei corporale la un pacient cu obezitate morbidă, în urma unei intervenţii de modificare a stilului de viaţă.

Metode. S-au realizat măsurători antropometrice şi ale compoziţiei corporale la începutul intervenţiei, pe parcursul fiecărei şedinţe de monitorizare (n=6), la finalul intervenţiei, precum şi la 12 luni de la finalizarea acesteia. Atât şedinţa de evaluare iniţială, cât şi şedinţele de monitorizare, au fost realizate sub îndrumarea unui nutriţionist-dietetician licenţiat.

Rezultate. Studiul a evidenţiat scăderi semnificative clinic ale greutăţii, indicelui de masă corporală (IMC), masei grase totale, masei grase abdominale şi circumferinţei abdominale în urma intervenţiei nutriţionale aplicate.

Concluzii. Studiul de faţă a evidenţiat faptul că intervenţia nutriţională individuală şi personalizată a reprezentat o strategie utilă în managementul obezităţii morbide în cazul pacientului inclus în studiu.

Cuvinte cheie: obezitate morbidă, intervenţie nutriţională personalizată şi individuală, compoziţie corporală.

Received: 2014, May 7; *Accepted for publication:* 2014, August 20;
*Address for correspondence: I*uliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Department of Bromatology, Hygiene, Nutrition, Louis Pasteur Str. No.6
E-mail: lorenafilip@yahoo.com

Introduction

Obesity and overweight are directly involved in the increase of morbidity, having a major impact on the evolution of certain chronic diseases such as: high blood pressure, dyslipidemia, diabetes mellitus type 2, coronary diseases, myocardial infarction, osteoarthritis, bladder diseases, sleep apnea, respiratory diseases and types of cancer (***, 2013). Also, being overweight may have important psychological and economic implications for the wellbeing and health of the population. In Romania, over 15 million people suffer from obesity and overweight (1).

Obesity is an excessive cumulation of adipose tissue in the body which can affect the health, defined by a body mass index (BMI) ≥ 30 kg / m^2 (2). Third degree obesity or morbid obesity is defined by a BMI ≥ 40 kg / m^2 (Hâncu et al., 2010).

BMI is a parameter easy to use in current practice, although it does not directly measure the distribution and quantity of adipose tissue and does not take into consideration other factors, such as the level of physical activity, gender or age.

Bioelectrical impedance is a non-invasive method used to determine the body composition (Lee & Gallagher, 2008). This method helps to calculate the total amount of water, the fat-free body mass and the fat. This method supposes the passing of an electric current through the body, and following this procedure the conductivity of water in the body varies in different compartments (Mahshid et al., 2008; Ayvaz & Cimen, 2011).

In the management of obesity, including morbid obesity, a reduction of 5-10% from the initial weight brings a lot of benefits for comorbidities (Karlsen et al., 2013). The therapeutic education achieved by an individualized and personalized nutritional intervention is a method of clinical management, which ensures the active implication of a person with obesity. The optimization of lifestyle, the induction of new information, attitudes and skills, the determination and maintenance of motivation can be done only by specific, systematic and continuous education (Hâncu et al., 2010). The modifications of lifestyle (diet, behavior, attitude, physical activity) are basic strategies in the intervention on obesity on a long term basis (Wadden et al., 2013).

Objectives

The aim of the present study was to evaluate the evolution of the anthropometric measurements and the body composition of a patient suffering from morbid obesity, following an intervention determining lifestyle changes.

Hypothesis

The approach of a patient suffering from morbid obesity through an individualized and personalized nutritional intervention together with a regulated physical activity can be a successful strategy in order to reduce weight and the abdominal circumference and to modify the body composition. Also, the nutritional education of the patient can help maintain these results for a long time.

Material and method

Research protocol

According to the Helsinki Declaration, the Amsterdam Protocol and Directive 86/609/EEC, we obtained the approval of the Ethical Commission of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca for this study. The informed consent of the patient who participated in this research was given.

a) *Period and place of the research*

The study took place in the period April 2013 – August 2014. The patient participated in nutritional intervention meetings, coordinated by a nutritionist – dietician, for a period of 18 weeks (every three weeks). In order to better evaluate the effects of the individualized and personalized nutritional intervention, the patient came back for measurements 12 months after the intervention was completed.

b) *Subjects and groups*

The evaluated patient in this study was a 34 years old male, coming from an urban area, suffering from morbid obesity (BMI=40.3 kg/m^2), who searched for the help of a dietician in order to lose weight.

The patient did not have a personal pathological history, and as to his family history, the patient declared that his mother suffered from type 2 diabetes and his father suffered from morbid obesity.

The patient denied consuming drugs and was not on medical treatment during the period of the study.

The initial parameters recorded: weight (G) = 124.8 kg, BMI = 40.3 kg/m^2, total fat = 44.7 kg (35.82%), abdominal fat = 23.5 kg, waist circumference = 130 cm, total water = 58.6 kg (47%), fat-free body mass = 80.1 kg (64.2%).

c) *Tests applied*

The initial evaluation supposed a 90-minute interview conducted by a nutritionist – dietician, which included the clinical and diet history, the anthropometric evaluation and the evaluation of body composition. The diet history additionally included a nutritional journal for 24 hours and a questionnaire regarding nutritional frequency.

Anthropometric and body composition measurements were carried out. Height was measured using a Tanita HR 001 stadiometer (Tanita Corporation, Tokyo, Japan) in order to calculate the BMI. The waist circumference was measured with a Seca ergonomic meter (Seca North America, USA).

The weight and body composition (total fat, fat-free body mass, total body water, abdominal fat) were measured using the Tanita 418 MA body composition analyzer (Tanita Corporation, Tokyo, Japan).

The measurements were performed at the beginning and at the end of the intervention, and also a year after the intervention was completed. The weight and body composition were measured on each monitoring meeting.

The measurements were made at the same moment of the day, in cozy clothes, without shoes, socks and metal objects.

The subject declared that he had not been exercising, had not consumed alcohol 24 hours before the evaluation and had not taken diuretic substances.

The intervention lasted for 18 weeks, with periodic monitoring meetings of 30 minutes every three weeks.

The method that we used was therapeutic education through individualized and personalized nutritional education, for learning and gradually implementing healthy nutritional principles and for the modification of nutritional habits. The educational nutrition themes discussed on each monitoring meeting are presented in Table I. Also, we used the person-centered therapy, which insists on individual

needs and involves the patient in the establishement of objectives and in decision making.

Table I
The educational nutrition themes discussed on each monitoring meeting.

Monitoring meeting	Educational theme
1	Macronutrients and micronutrients
2	Planning meals and introducing healthy snacks
3	Groups of foods
4	Combining foods during meals
5	The portion control
6	Reading food labels and making a shopping list

After the intervention period, the patient was instructed to monitor his food intake and his weight with the help of a nutritional journal.

d) *Statistical processing*

In order to analyze the data, we used frequency tables and graphic representations using Microsoft Excel 2010 (Microsoft Office 2010).

Results

The initial parameters and the parameters recorded during the intervention are presented in Table II.

After the individualized and personalized nutritional intervention was completed, we found a 16.7% weight loss compared to the initial value (20.9 kg), and the BMI was reduced from 40.3 kg/m^2 to 33.5 kg/m^2, corresponding to class 1 obesity. The evolution of weight during the intervention is presented in Figure 1, and the evolution of BMI in Figure 2.

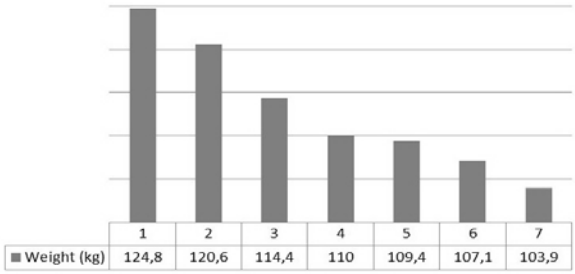


Fig. 1 – The evolution of weight during the intervention.

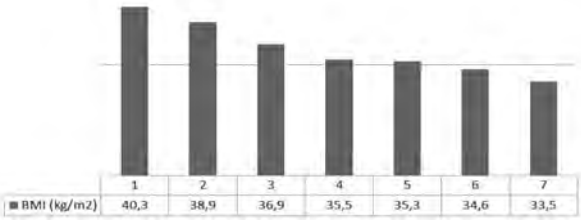


Fig. 2 – The evolution of BMI during the intervention.

Following the nutritional intervention, total fat decreased by 16.2 kg (77.5%), of which 39.5% was abdominal fat (6.4 kg). The evolution of fat mass during the intervention is presented in Figure 3, and the evolution of abdominal fat during the intervention is presented in Figure 4.

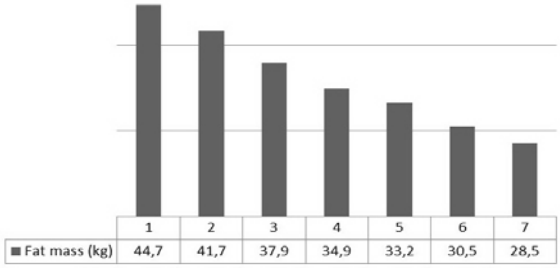


Fig. 3 – The evolution of fat mass during the intervention.

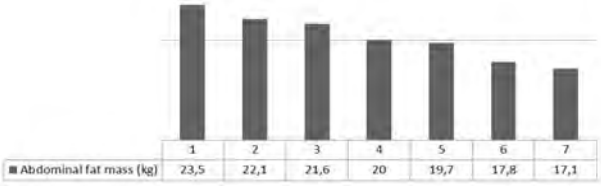


Fig. 4 – The evolution of abdominal fat during the intervention.

Also, the waist circumference decreased by 20 cm, from 130 cm to 110 cm.

Simultaneously with the nutritional and eating behavior changes, after the first meeting the patient began a moderate physical activity under the supervision of a personal trainer, in sessions of 60 minutes per day, 5 days per week.

The parameters at the beginning of the nutritional intervention, at the end of the 18 weeks and after a year are presented in Table III.

Table III
Parameters a year after the beginning of the intervention.

Parameter	Initial meeting	Final meeting (after 18 weeks)	Evaluation (after 12 months)
Weight (kg)	124.8	103.9	102.8
BMI (kg/m2)	40.3	33.5	33.2
Fat mass (kg)	44.7	28.5	29.4
Fat mass (%)	35.8	27.4	28.6
Abdominal fat mass (kg)	23.5	17.1	17.2
Fat-free body mass (kg)	80.1	75.4	73.4
Total body water (kg)	58.6	55.2	53.7
Waist circumference (cm)	130	120	122

Table II
Initial parameters and parameters recorded during each intervention.

Parameters	Initial meeting	Meeting 1	Meeting 2	Meeting 3	Meeting 4	Meeting 5	Meeting 6
Weight (kg)	124.8	120.6	114.4	110	109.4	107.1	103.9
BMI (kg/m2)	40.3	38.9	36.9	35.5	35.3	34.6	33.5
Fat mass (kg)	44.7	41.7	37.9	34.9	33.2	30.5	28.5
Fat mass (%)	35.8	34.5	33.1	31.7	30.5	28.4	27.4
Abdominal fat mass (kg)	23.5	22.1	21.6	20	19.7	17.8	17.1
Fat-free body mass (kg)	80.1	78.9	76.5	75.1	76.3	76.6	75.4
Total body water (kg)	58.6	57.8	56	55	55.9	56.1	55.2

Discussions

The individualized and personalized nutritional intervention applied in the case of this patient proved to be beneficial, leading to a significant decrease of the recorded clinical parameters.

As to weight and BMI evolution, there was a significant loss (from 124.8 kg to 103.9 kg; from 40.3 kg/m^2 to 33.5 kg/m^2). We also found an important reduction of total fat mass from 44.7 kg to 28.5 kg, and abdominal fat was reduced by 6.4 kg, influencing the reduction of waist circumference by 20 cm.

The interventions based on diet changes combined with physical activity proved to be more successful in the reduction of weight and BMI compared to the interventions based on only one of these components (Stephens et al., 2014).

Previous studies proved that changes of waist circumference are correlated with modifications of intra-abdominal fat. Slentz et al. (2005) demonstrated that a weight loss of 2 kg is associated with a 7% reduction of body fat.

Ross et al. (2004) reported that a loss of 6 kg by physical exercise resulted in a 6.5 cm reduction of the waist circumference and a 30% decrease of intra-abdominal fat.

The patient was taught to monitor his nutrition and weight. We consider that the adequate training of the patient regarding self-monitoring after nutritional intervention is extremely important in order to maintain the results obtained, which is shown by the studies performed in this field (***, 2013).

Individualized nutritional training supposes teaching the patient about the importance of nutrition, offering materials for each discussed subject, which will help remember the message and achieve the nutritional objective in the long term. Individualized and group nutritional education can contribute to a reduction in the health care costs for the patient and for society, and it is a method through which the patient learns methods of self-monitoring and self-care that can be applied in the long term (Splet & Myers, 2001).

The studies comparing individualized nutritional education versus group education in order to improve nutritional intake and nutritional status parameters (BMI, weight, body fat, waist circumference) found that individualized nutritional education can be a successful strategy for the improvement of diet quality in adults (Eyles & Mhurchu, 2009). This method was beneficial for weight loss and the reduction of fat tissue (Byrne et al., 2006).

General knowledge of nutrition influences nutritional habits (Tsigos et al., 2008), but the effectiveness of nutritional intervention depends on the relevance of this subject for each individual (Heimendinger et al., 2005).

Conclusions

1. The individualized and personalized nutritional intervention improved the anthropometric parameters and the body composition parameters for our patient, with real benefits for the clinical management of overweight and obese patients.

2. Regulated and personalized physical activity is an essential component of lifestyle which improves the results of individualized and personalized nutritional intervention.

3. The individualized nutritional intervention and the training of the patient for self-monitoring after the intervention is completed allow for the maintenance of results in the long term.

Conflicts of interests

There are no conflicts of interest.

References

Ayvaz G, Cimen AR. Methods for Body Composition Analysis in Adults. Open Obes J, 2011;3:62-69.

Byrne N, Meerkin J, Laukkanen R, Ross R, Fogelholm M, Hills A. Weight loss strategies for obese adults: personalized weight management program vs. standard care. Obes. 2006;14:177-188.

Hâncu N, Roman G, Vereşiu I. Diabetul zaharat, nutriţia şi bolile metabolice. Tratat Vol. 2. Ed. Echinocţiu, Cluj-Napoca, 2010, 4-10, 170-183.

Heimendinger J, O'Neil C, Marcus AC et al. Multiple tailores message are effective in increasing fruit and vegetable consumption among callers to the Cancer Information Service. J Health Commun, 2005;10(Suppl):65-82.

Karlsen TI, Sohagen M, Hjelmesaeth J. Predictors of weight loss after an intensive lifestyle intervention program in obese patients: a 1-year prospective cohort study. Health Qual Life Outc 2013;11:165.

Lee SY, Gallagher D. Assessment methods in human body composition. Curr Opin Clin Nutr Metab Care. 2008;11:566-572.

Mahshid D, Anwar TM. Is bioelectrical impedance accurate for use in large epidemiological studies ? Nutr J, 2008;7:26.

Ross R, Janssen I, Dawson J et al. Exercise-induced reduction in obesity and insulin resistance in women: a randomized controlled trial. Obes Res. 2004;12:789-798.

Slentz CA, Aiken LB, Houmard JA et al. Inactivity, exercise, and visceral fat. STRRIDE: a randomized, controlled study of exercise intensity and amount. J Appl Physiol. 2005;99:1613-1618.

Splett P, Myers EF. A proposed model for effective nutrition care. J Am Diet Assoc. 2001;101:357-363.

Eyles HC, Mhurchu CN. Does tailoring make a difference? A systematic review of the long-term effectiveness of tailored nutrition education for adults. Nutr Rev. 2009;67(8):464-480;

Stephens KS, Cobiac LJ, Veerman JL. Improving diet and physical activity to reduce population prevalence of overweight and obesity: An overview of current evidence. Prev Med. 2014; 62:167-178.

Tsigos C, Hainer V, Basdevand A et al. Management of obesity in adults: Europeanclinical practice guidelines. Obes Facts 2008; 1(2):106-116.

Wadden TA, Volger S, Tsai AG et al. Managing Obesity in Primary Care Practice: An Overview and Perspective from the POWER-UP Study. Int J Obes. 2013;37(1):S3–11.

***. American College of Cardiology, American Heart Association.Guidelines for the management of overweight and obesity in adults, 2013.

Websites

(1) World and Health Organization. Noncommunicable diseases country profiles 2011. Available online at: http://www.who.int/nmh/countries/2011/rou_en.pdf?ua=1 Accessed on 2014, July 10.

(2) World and Health Organization. Obesity and Overweight 2014. Available online at: http://www.who.int/mediacentre/factsheets/fs311/en/ Accessed on 2014, July 10.

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 227–232

Project for the testing of the fitness level of students and carrying out kinetic prophylactic programs to increase the endurance level

Proiect de testare a nivelului de fitness la studenţi şi realizarea de programe kinetoprofilactice de creştere a nivelului de anduranţă

Mihaela Ganciu, Adriana Stoicoviciu
Department of Physical Education and Sport, Faculty of Psychology and Scientific Education, University of Bucharest

Abstract

Background. It is well documented that exercise exerts multiple positive effects on the body, including the maintenance and strengthening of health functions, and is also a means of recovery in different more or less serious conditions. Exercise is the basis of kinetic prophylaxis, with applications addressing primarily healthy people and people who are in special biological situations.

Aims. The research aimed at highlighting the fitness of students from the University of Bucharest and providing students with kinetic prophylactic programs to increase endurance levels in order to promote, maintain or regain health.

Methods. We used experimentally a myoarthrokinetic test which includes joint mobility testing, balance testing, and muscular strength testing. The final results will be statistically analyzed and graphically represented.

Results. The results of the study will highlight that fitness exercises and the programs for improving strength, mobility and balance lead to a significant increase in scores obtained by students in the ten tests of the Hettinger system.

Conclusions. Physical exercise as a way to strenghten health leads to functional improvement and increased psycho-physical efficiency. It is known that after the age of 20 years, the myoarthrokinetic system begins to decline, so it is important that healthy young people know kinetotherapy programs, which are based on physical exercise, in order to maintain and optimize health and to prevent premature degradation of the body and its functions in general.

Keywords: fitness, kinetotherapy, endurance, students.

Rezumat

Premize. Ideea de la care s-a pornit, care stă la baza studiului este aceea că exerciţiul fizic exercită multiple influenţe pozitive asupra organismului, printre care menţinerea şi întărirea sănătăţii, a funcţiilor, dar şi mijloc de recuperare în diferite afecţiuni mai mult sau mai puţin grave. Exerciţiul fizic stă la baza kinetoprofilaxiei, cu aplicaţii ce se adresează în primul rând oamenilor sănătoşi, dar şi oamenilor aflaţi în situaţii biologice speciale.

Obiective. Cercetarea şi-a propus să evidenţieze nivelul de fitness al studenţilor Universităţii din Bucureşti şi să ofere studenţilor programe kinetoprofilactice de creştere a nivelului de anduranţă pentru promovarea, menţinerea sau recâştigarea sănătăţii.

Metode. Vom folosi un experiment de tip constatativ. Se testează aparatul mioartrokinetic care cuprinde: testarea mobilităţii articulare, testarea echilibrului, testarea forţei musculare. La final rezultatele vor fi prelucrate statistic şi reprezentate grafic.

Rezultate. Rezultatele studiului vor evidenţia faptul că în urma practicării exerciţiilor de fitness, a programelor pentru îmbunătăţirea forţei, mobilităţii şi echilibrului, se va constata o creştere semnificativă a punctajului obţinut de studenţi, la cele zece probe ale sistemului Hettinger.

Concluzii. Exerciţiul fizic ca mijloc de întărire a sănătăţii, conduce în timp la perfecţionarea funcţională şi mărirea randamentului psiho-fizic. Este ştiut faptul că după vârsta de 20 de ani, aparatul mioartrokinetic începe să intre în declin, de aceea, este important ca tinerii sănătoşi să cunoască programe de kinetoterapie ce au la bază exerciţiile fizice, în scopul menţinerii şi optimizării stării de sănătate, în vederea prevenirii degradării premature a organismului şi a funcţiilor sale în general.

Cuvinte cheie: fitness, kinetoterapie, anduranţă, studenţi.

Received: 2014, March 20 ; *Accepted for publication:* 2014, July 10;
Address for correspondence: University of Bucharest, Faculty of Psychology and Scientific Education, Department of Physical Education and Sport. M. Kogălniceanu Av. No. 36-46 sector 5, Bucharest
E-mail: mihaelaganciu26@yahoo.ro

Introduction

The concept of fitness takes its origins in the Anglo-Saxon literature, representing a theme approach for people who search solutions to raise their quality of life and maintain their health (Dumitru, 2007).

Fitness is (Falls et al., 1980, quoted by Sabău, 2002) a form of self-motivated and systematic participation in physical exercise, to improve the quality of life.

Fitness is a multidimensional, dynamic condition, which is based on positive health and which includes a lot of components: intellectual, social, spiritual and physical fitness (Hidi, 2007).

Fitness is a term that indicates the level of the cardiovascular system, as a result of high energy reserves. It strictly refers to the amount of oxygen consumption. Practically, it refers to the optimal performance of the body and its state of welfare. We can speak about fitness levels, which are determined by age, sex, heredity, inactivity or training, disease condition, etc.

Physical fitness in relation to health consists of: cardiorespiratory resistance, muscle strength, mobility and body composition.

Kinetotherapy is part of physical medicine – a therapeutic specialty which uses the following methods: movement, heat, electric power, climate, massage and water. It is the newest branch of physical medicine and represents an active methodology for the consolidation or restoration of body functions affected by diseases or trauma (Cordun, 2009).

Kinetotherapy is an individual therapeutic form which, starting from static and dynamic exercises, can be used in prophylactic treatment and recovery programs, in order to maintain a good functional level or increase the functional level (gymnastics, fitness, walking, jogging, aerobics, for good health) (Cordun, 1999).

The general objectives in the treatment by kinetotherapy are (Kiss, 2007):

- restoration of muscle strength and increase of muscle resistance;
- increase and adaptation of exercise capacity, improvement of coordonation functions, control and balance of the body;
- relaxation training capacity;
- posture of the body;
- increase of joint mobility;
- rehabilitation sensitivity.

Endurance is a sustained effort at high parameters and is expressed by the capacity to maintain effort as long as possible, in the absence or suppression of fatigue, without significant changes in respiratory and cardiac frequency (Bompa, 2001).

Endurance depends on the pulmonary function, blood oxygen transport capacity, cardiac function, capacity of the tissue to extract oxygen from blood, and on the muscle oxidative potential.

Physical education is an activity which works the whole body, so that we can talk about a close relation with medicine. Physical exercise is an important way to strengthen health, with a prophylactic and a therapeutic role.

Specialists consider that physical activity is a factor of first importance for the quality of life (Balint, 2010).

We aimed to find potential deficits of the body by testing the myoarthrokinetic system with the Hettinger test (Sbenghe, 2005). Also, we wanted to inform students about the effects of systematic physical exercise and the programs aimed at maintaining and optimizing health in order to prevent premature degradation of the body and its functions.

The current state of knowledge in the thematic area

Colibaba & Bota (1988) consider that fitness is full vitality (the related physical availability) of the human body, allowing to obtain high results in some activity, test or sports discipline. In other words, general physical condition or fitness ensures:

- health;
- prevention of illness;
- delay of aging;
- conservation of professional or occupational skills;
- physical and mental health gained by practicing physical exercise or leisure activities;
- updating or permanent reconstruction of the self by systematic practice;
- integration in the social environment;
- general physical capacity as a basis of high results.

Keeping an ideal body weight is based on a positive self-image. Fitness acts on the self-image and physical aspect.

The majority of the English specialists distinguish two types of fitness (Morrow & Jackson, 2010):

a) fitness, whose components can be improved even if a person does not have physical abilities, positive results depending only on health;

b) motor fitness, whose components are based on neuromuscular physical fitness, with an important genetic determination, the evolution of these being limited

Motor fitness derives from the general concept of fitness and means movement efficiency.

Fitness can be decomposed in:

- physical fitness – optimization of physical condition;
- mental, emotional fitness - psychic comfort, emotional stability, self-confidence;
- intellectual fitness - optimization of mental procceses, positive thinking, creativity;
- social fitness - interhuman relation, self-respect, professional success, social status;
- aesthetic fitness - appearance, body shape, in relation to tendencies, fashion;
- physiological fitness – optimization of vital body functions represented by the respiratory, cardiovascular systems, adequate metabolism, central nervous system and analyzers.

Aerobic fitness or aerobic exercise capacity represents an important factor when speaking about functional capacity and health (Bota, 2002).

The term aerobic resistance is determined by metabolic characteristics of energetic processes (Todea, 2001).

Allsen et al. (1989) consider physical fitness a reflection of the ability to work with vigor and pleasure, without fatigue, having sufficient energy for hobbies and recreative activities, which is related to the mental and physical state.

Physical fitness is part of physical education, which must become a responsibility for sport teachers. Aerobic exercise has been practiced for a long time in order to lose weight and achieve physical fitness. In establishing programs for increasing and maintaining physical fitness, the following principles of life should be taken into consideration: overcompensation, specificity, progressive effort, frequency, intensity and duration, individualization (Dragnea & Bota, 1999).

To have a high fitness level means to have the energy and strength to perform daily activities in a vigorous manner and in the end to have enough energy left for fun actions and urgent requests; the heart and lungs must be strong, and the weight and percentage of body fat must be within the recommended parameters: for women less than 25% of the body weight, for men less than 18% of the body weight (Sheehy, 1993).

Physical fitness is not only a training program executed 2-5 times a week, fitness is a way of life for everybody, during which people spend their free time training and socializing. When we speak about sanogenic effects, we refer to positive physical changes as well as to a good influence against diseases (Plas & Hagron, 2001).

Corbin & Lingsey (1984) explain why a good level of fitness is the positive answer to these questions:

- Do you perform daily work vigorously, without feeling fatigue?
- Do you have a correct body posture?
- Do you have sufficient energy for free time activities, at the end of the day?
- Do you have a thin and agile body?
- Can you sustain prolonged physical effort?

Useful applications of fitness include (Kenneth, 2000):

- elimination of stress and tension and an inoffensive way to release anger;
- a challenge, elimination of boredom;
- current problems are forgotten, and later, they will not be so stressful;
- sleep is good and the person feels much better;
- if the person is good enough in an activity, it raises self-confidence;

Social benefits of fitness in the free time include (Katz, 1988):

- meeting people with common interests and making new friendships;
- developing team-work and the capacity of cooperation, which is good for other activities than sport.

Fitness exercises are frequently used in kinetotherapy because of their simplicity and because they act on different muscle groups, facilitating the monitoring of the evolution of the person between sessions.

Objectives

Establishing the principal indicators that assess the level of fitness. Selection of methods. Finding physical deficiencies. Training by establishing the intensity, duration and frequency of exercise programs. We wanted to have a complete image of the fitness level of the University of Bucharest students, in order to have objective arguments for making decisions about programs for the promotion, maintenance and recovery of health.

Hypothesis

The engagement in and commitment to an aerobic physical activity has a positive influence on the human body, reflected by improved levels of motor and functional abilities, when individuals male or female are practicing these types of physical activities.

Materials and methods/ study design

Research protocol

The study was approved by the Ethics Committee of the University of Bucharest and the students gave their informed consent.

a) *Period and place of the research*

The project spans a 2 year period, from 2014 to 2016, in which we hope to test the fitness level of the students and to develop kinetic prophylactic programs to increase their endurance level, including body activities practiced regularly. In this project, teachers from the University of Bucharest and other universities will participate.

Research stages

The research will be carried out in several stages:

- development, files registration: 1-30 September 2014
- the sample: 1-15 October 2014
- measurements: 15-30 October 2014
- recording of results: 1-30 November 2014
- data processing, correlation parameters investigated: 1 December 2014 - 30 February 2015
- conclusions: 1-15 March 2015
- developing programs to optimize health: 1-30 April 2015
- application: May-December 2015
- making feed-back by repeating the measurements: 15-30 January 2016
- final conclusions: 1-15 March 2016

b) *Subjects and groups*

We aim to evaluate 1500 first year students (500 male and 1000 female) studying different sport disciplines.

c) *Tests applied*

The testing methods used are aimed at the objective evaluation of the myoarthrokinetic system: joint mobility testing, balance testing, and muscular strength testing.

Testing of the myoarthrokinetic system

The literature shows that after 20 years of age, the myo-arthrokinetic system begins to decline, intervertebral discs and vertebral cartilage start to present degenerative elements that occur on a metabolic background. Subsequent evolution is determined by a limitation of movement and a decrease in the quantity and quality of movements (Cordun, 2011).

One of the most successfully used systems aimed at myoarthrokinetic testing is the *Hettinger* system (Sbenghe, 1987), which can prove that healthy persons may have important deficits that in time affect the body structure and function. The exercises testing the myoarthrokinetic system applied in the study are shown in Table I.

d) *Statistical processing*

The software programs used for statistical calculation are: Microsoft Word, Microsoft Excel (Gagea, 1999). The main statistical indicators will be calculated: X-arithmetic, S-standard deviation, Cv%-variability coefficient. Graphic representation will allow the expression of the processed data and findings (Tudor, 2008).

Table I
Exercices for the test of the myoarthrokinetic system.

Physical exercise-technical description	Image	Score
Testing joint mobility and balance: - From a vertical position (with relaxed and streched knees and closely positioned feet), the subject has to bend his/her body until he/she touches the floor with the palms of the hands.	 Fig. 1	- palms touching the floor - 10 points - fingers touching the floor - 8 points - finger tips touching the floor - 6 points - less than 2 cm distance remaining between the fingers and the floor - 5 points - 3-5 cm distance remaining between the fingers and the floor - 4 points - 6-10 cm distance remaining between the fingers and the floor - 3 points - 11-15 cm distance remaining between the fingers and the floor - 2 points - for a distance greater than 15 cm between the fingers and the floor - 1 point
- From a sitting position on the floor, hold the foot with both hands to be able to bring the hallux bone of the big toe next to the nose (bend the upper body, keep the head forward and guide your foot with both hands).	 Fig. 2	- if able to touch the nose - 5 points - less than 5 cm distance remaining between nose and foot - 4 points - 5-10 cm distance remaining between nose and foot - 3 points - 10-20 cm distance remaining between nose and foot - 2 points - a distance greater than 20 cm remaining between nose and foot - 1 point
- From a standing upright position, the back of the right hand on the back with elbow towards the floor, the fingers orientated upwards, try to overlap them with the figers of the left arm which is brought over the shoulder with elbow positioned upwards and the palm touching the back reaching for the right hand.	 Fig. 3	- for overlapping fingers - 5 points - touching fingers - 4 points - a distance of 5 cm remaining between fingers - 3 points - a distance of 5-10 cm remaining between fingers - 2 points - a distance greater than 10 cm remaining between fingers - 1 point
- Position the arm and the forearm at 90 degrees, keeping the elbow close to the body. On the open palm place a 40-50 cm ruler. Try to balance the ruler and count: 21, 22, 23 for each second until the ruler falls. Perform the exercise three times with each arm, taking into consideration the best performance.	 Fig. 4	- over 12 seconds (counting above 32) - 5 points - up to 10-12 seconds - 4 points - up to 7-9 seconds - 3 points - up to 4-6 seconds - 2 points - under 3 seconds - 1 points
- Place a towel on the floor and try to lift the towel with your toes in the air until the thigh/ femoral bone is parallel with the floor/ 90 degrees with the body.	 Fig. 5  Fig. 6	- complete five attempts with each leg and 1 point will be awarded for each successful attempt.

Table I

Exercices for the test of the myoarthrokinetic system.

Physical exercise-technical description	Image	Score
Testing muscle strength - From a dorsal decubitus position, lift the upper body and legs simultaneously until balance is obtained by sitting on the coccyx area of the body, with hands placed on the thighs.	 Fig. 7	- over 45 seconds - 10 points - up to 41-45 seconds - 9 points - up to 36-40 s - 8 points - up to 6-10 seconds - 2 points - under 5 seconds - 1 points
- From a ventral decubitus position, place the palms on the buttocks and lift the legs, keeping them streched and record the time during which this position is maintained.	 Fig. 8	- over 45 seconds - 10 points - up to 41-45 seconds - 9 points - up to 36-40 seconds - 8 points - up to 6-10 seconds - 2 points - under 5 seconds - 1 point
- From a pushup position (the rhythm is given by counting 21, 22, 23, etc. with each pushup per second), perform the exercise by lightly touching the floor with the abdomen.	 Fig. 9  Fig. 10	Men / Women / Score above 21 pushups / above 14 pushups / 10 points 21 pushups / 14 pushups / 9 points 18 pushup / 12 pushups / 8 points 15 pushups / 10 pushups / 7 points 12 pushups / 8 pushups / 6 points 9 pushups / 6 pushups / 5 points 6 pushups / 4 pushups / 4 points 4 pushups / 3 pushups / 3 points 3 pushups / 2 pushups / 2 points 2 pushups / 1 pushups / 1 points
- From a ventral decubitus position, keep feet close together and bend them under the body. Perform the "rabbit jump" to stretch the legs, keeping head towards the floor and buttoks upwards as in image no 12.	  Fig. 11 Fig. 12  Fig. 13	Men / Women / Score over 24 jumps / over16 jumps / 10 points 24 jumps / 16 jumps / 9 points 21 jumps / 14 jumps / 8 points 18 jumps / 12 jumps / 7 points 15 jumps / 10 jumps / 6 points 12 jumps / 8 jumps / 5 points 9 jumps / 6 jumps / 4 points 6 jumps / 4 jumps / 3 points 4 jumps / 3 jumps / 2 points 2 jumps / 1 jumps / 1 points
- From a dorsal decubitus position, with palms placed behind the neck, perform upper body liftups. Keep the heels on the ground to maintain stability and follow the rhythm of a second for a liftup and another second for a laydown. The score is different for the two sexes.	 Fig. 14  Fig. 15	Men / Women / Score over 27 liftups / over 18 liftups / 10 points 27 liftups / 18 liftups / 9 points 24 liftups / 16 liftups / 8 points 21 liftups / 14 liftups / 7 points 18 liftups / 12 liftups / 6 points 15 liftups / 10 liftups / 5 points 12 liftups / 8 liftups / 4 points 9 liftups / 6 liftups / 3 points 6 liftups / 4 liftups / 2 points 4 liftups / 3 liftups / 1 points

Expected results

The evaluation of the fitness level will be done by testing the myoarthrokinetic system, which will include testing joint mobility, the ability to maintain a state of balance, and muscular endurance.

The results of this study will highlight that the benefit of practicing fitness programs is reflected in a significant growth of the number of points/score obtained by the students in the ten types of physical exercices of the Hettinger system.

1. All the characteristics of physical fitness are directly influenced by the level of health of every individual, but overall the fitness level can be significantly improved for each individual even when the individual is lacking sports aptitudes.

2. Fitness education is an important component of physical education, which we wish to promote and implement and which will bring the ultimate benefit of improving the wellbeing and the health level of every individual.

3. The programs which have been designed and experimented are aimed at improving the fitness level and help students to orientate themselves towards the self-analysis and self-evaluation of their own body health potential. These programs will contribute not only to an improved fitness level, but also to a harmonious development of individual personality.

4. The collected data that will reflect the students' level of fitness will allow to reorganize the means suitable for every sport discipline, so that the students will be evaluated and graded taking into consideration their individual interest and commitment and real progress during the courses they study rather than their athletic performance.

Conflicts of interests

There are no conflicts of interest declared in regards with this study.

Acknowledgments

All teaching staff from the Department of Physical Education and Sports of the University of Bucharest have contributed to the successful development and finalization of this project which has tested a sample population of approximately 1,500 students currently studying a range of sport disciplines.

References

Allsen PE, Harrison JM, Vance B. Fitness for Life-An Individualized Approach. Wm. C. Brown Pub. Dubuque, Iowa, 1989

Balint NT. Kinetoprofilaxie-curs studii de licenţă. Ed. Alma Mater, Bacau, 2010.

Bompa T. Dezvoltarea calităţilor biomotrice. Ed. Ex. Ponto, Bucureşti, 2001.

Bota A. Exerciţii fizice pentru viaţă activă. Ed. Cartea universitară, Bucureşti,2006.

Bota C. Fiziologie generală-Aplicaţii la efortul fizic. Ed. Medicală, Bucureşti, 2002.

Colibaba ED, Bota I. Jocuri sportive. Teorie şi metodică. Ed. Aldin, Bucureşti, 1988.

Corbin C, Lindsey R. The Ultimate Fitness Book. New York: Leisure Press, 1984, 95-119.

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

Cordun M. Kinesiologie medicală. Ed. Axa, Bucureşti, 1999.

Cordun M. Bioenergetică şi Ergometrie în sport. Ed. CD Press, Bucureşti, 2011.

Dragnea A, Bota A. Teoria activităţilor motrice. Ed. Didactică şi Pedagogică Bucureşti, 1999.

Dumitru G. Sănătate prin sport pe înţelesul fiecăruia. Ed. Sportul pentru toţi, Bucureşti, 2007.

Gagea A. Metodologia cercetării ştiinţifice în educaţie fizică şi sport. Ed. Fundaţia „România de mâine", Bucureşti, 1999.

Hidi IL. Fitness. Ed. Didactică şi pedagogică, Bucureşti, 2007.

Katz J. Fitness works-a blueprint for lifelong fitness, Human Kineties Pub. (UK) Ltd, 1988.

Kenneth H. Notes on Physical Fitness. Institute for Aerobics research. Dallas, 2000.

Kiss I. Fizio-kinetoterapie şi recuperare medicală. Ed. Medicală, Bucureşti, 2007.

Morrow JR, Jackson A. Measurement and Evaluation în human performance. Fourth Edition, Human Kinetics Pub. (UK) Ltd, 2010.

Plas F, Hagron E. Kinetoterapie activă, exerciţii terapeutice. Ed. Polirom, Iaşi, 2001.

Sabău E. Fitness la copii. Ed. Arvin, Bucureşti, 2002.

Sbenghe T. Kinesiologie, ştiinţa mişcării. Ed. Medicală, Bucureşti, 2005.

Sbenghe T. Kinetologie profilactică, terapeutică şi de recuperare. Ed. Medicală, Bucureşti 1987.

Sheehy K. Terapia prin Fitness. Ed. Aquila, Oradea 1993.

Todea S. Exerciţiul fizic în educaţie fizică şi sport şi kinetoterapie. Ed. Fundaţia „România de mâine", Bucureşti, 2001.

Tudor V. Măsurarea şi evaluarea în cultură fizică şi sport. Ed. Morogan, Bucureşti, 2008.

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 233–237

Expression of sensory submodalities by neurolinguistic programming methods in sport training

Exprimarea submodalităţilor senzitive prin limbaj în programarea neurolingvistică din antrenamentul sportiv

Vlad Teodor Grosu[1], Cornelia Popovici[2], Marin Dumitrescu[1], Emilia Florina Grosu[4]
[1] *Technical University, Cluj-Napoca*
[2] *"Iuliu Haţieganu" University of Medicine and Pharmacy, Cluj-Napoca*
[3] *Faculty of Physical Education and Sport,"Babeş-Bolyai" University, Cluj-Napoca*

Abstract

Background. This research assumes the possible increase of athletic performance in any sport, by applying mental training techniques, particularly sensory submodalities in neurolinguistic programming.

Aims. We studied the relationships between sensory submodalities in neurolinguistic programming. We wanted to check the degree of significance of the mean difference in the studied parameters and whether the resulting significance threshold fell within the objective parameters.

Methods. We applied the Bandler & Thomson (2012) and Jacobson (2011) tests. These were applied to students of the Faculty of Physical Education and Sport, Babes-Bolyai University Cluj-Napoca. They completed the tests, with words describing feelings, perceptions and representations accompanying the description of motor acts. Motor acts are specific motor skills in every sport used in mental training. The words chosen by students who completed the questionnaires were able to provide information regarding the precision and accuracy of movement representations in mental training of FEFS students. There were two testing moments: T1 and T2, after 30 days.

Results. We evaluated the results recorded in the three major categories of visual, auditory, and kinesthetic sensations in students of the experimental group for the Bandler & Thomson and Jacobson tests at the two time points.

The statistical analysis of Bandler & Garner and Jacobson for paired samples (T1 and T2 moments) demonstrated no statistically significant differences ($p>0.05$), but there were many good and very good correlations in both tests between the values of the studied items. This is explained by the very small difference in time between the two test moments. In realizing ideomotor representations, all sensory submodalities are particularly important and underlie mental training.

Conclusions. In the Bandler & Thomson, the statistical analysis of the correlation between the values of the studied items showed a very good positive correlation between SA - SK (auditory and kinesthetic sensations) and a good positive correlation between SV-SA (visual and auditory sensations) and SV - SK (visual and kinesthetic sensations). Regarding the Jacobson test, the statistical analysis of the correlation between the values of the studied items showed a very good positive correlation between SV - SA (visual and auditory sensations), SV - SK (visual and kinesthetic sensations), SV - SOG (visual and olfactory, gustatory sensations), SA - SK (auditory and kinesthetic sensations) and SK - SOG (kinesthetic and olfactory, gustatory sensations). A good positive correlation was obtained between SA - SOG. (auditory and olfactory, gustatory sensations).

Keywords: ideomotor representation, neurolinguistic programming, sensory submodalities, sensations, training.

Rezumat

Premize. Cercetarea porneşte de la premiza posibilităţii creşterii performanţei în orice ramură sportivă, prin aplicarea tehnicilor de antrenament mental, în special prin submodalităţile senzoriale din programarea neurolingvistică.

Obiective. În cadrul programării neuro-lingvistice au fost studiate relaţiile dintre submodalităţile senzitive. S-a dorit verificarea gradului de semnificaţie a diferenţei mediilor parametrilor studiaţi şi dacă pragul de semnificaţie rezultat se încadrează în parametrii obiectivi.

Metode. Au fost aplicate testele lui Bandler & Thomson (2012) şi Jacobson (2011). Acestea au fost aplicate studenţilor de la Facultatea de Educaţie Fizică şi Sport din cadrul Universităţii Babeş-Bolyai din Cluj-Napoca. Aceştia au completat testele prin cuvinte care descriu senzaţiile, percepţiile şi reprezentările care însoţesc descrierea unor acte motrice. Actele motrice reprezintă deprinderile motrice specifice sportului respectiv, folosite în cadrul antrenamentului mental. Cuvintele alese de studenţi, care au fost completate în chestionare, pot da informaţii despre precizia şi acurateţea reprezentărilor mişcărilor din antrenamentul mental al studenţilor FEFS. S-au făcut două înregistrări: T_1 şi T_2, la interval de 30 zile.

Rezultate. Se observă rezultatele înregistrate pe cele trei categorii mai importante de senzaţii: vizuale, auditive, kinestezice la studenţii din grupul de experiment, la testul Bandler & Thomson, Jacobson, la cele două testări.

La analiza statistică atât a valorilor testului Bandler & Garner, cât şi la testul Jacobson, pentru probe perechi (momentele T_1 şi T_2), nu au fost observate diferenţe statistic semnificative ($p>0,05$), dar există foarte multe corelaţii bune şi foarte bune la ambele teste, între valorile itemilor studiaţi. Aceasta se explică prin diferenţa de timp foarte mică între momemntele celor două testări. În realizarea reprezentărilor ideomotorii toate submodalităţile senzitive sunt deosebit de importante şi stau la baza antrenamentului mental.

Received: 2014, May 25; *Accepted for publication:* 2014, August 20;
Address for correspondence: Faculty of Physical Education and Sport, Babeş-Bolyai University, Cluj-Napoca. Pandurilor Str. No. 7
E-mail: e_f_grosu@yahoo.it

Concluzii. Pentru testul Bandler & Thomson, analiza statistică de corelaţie între valorile itemilor studiaţi arată că există o corelaţie foarte bună şi de acelaşi sens între SA - SK (senzaţii auditive şi kinestezice) şi o corelaţie bună şi de acelaşi sens între SV - SA (senzaţii vizuale şi auditive) şi SV - SK (senzaţii vizuale şi kinestezice). Pentru testul Jacobson, analiza statistică de corelaţie între valorile itemilor studiaţi arată o corelaţie foarte bună şi de acelaşi sens între SV - SA (senzaţii vizuale şi auditive), SV - SK (senzaţii vizuale şi kinestezice), SV - SOG (senzaţii vizuale şi olfactiv, gustative), SA - SK (senzaţii auditive şi kinestezice) şi SK - SOG (senzaţii kinestezice şi olfactiv, gustative). O corelaţie bună şi de acelaşi sens s-a obţinut între SA - SOG. (senzaţii auditive şi olfactiv, gustative).

Cuvinte cheie: reprezentare ideomotorie, programare neurolingvistică, submodalităţi senzitive senzaţii, antrenament.

Introduction

The four pillars that support neurolinguistic programming according to (Ready & Burton, 2010) are: building a relation between the coach and athlete, awareness of sensations, externalization of thought, flexibility of behavior.

Movement representations provide the basis for the voluntary control of skilled movements in the form of a suitable organized perceptual-cognitive reference structured in long-term memory, according to Rosenbaum (2010) cited by Weigelt et al. (2011).

Bläsing et al. (2009) were able to demonstrate differences in the cognitive skill representations between novices, advanced and expert dancers for two complex ballet skills. From this observation, it can be inferred that becoming an expert in a particular sport may also rely upon the development of cognitive skill representations.

Sport has an agonistic dimension, providing a model by which we understand the multitude of significations and values that characterize it (Isidori, 2012).

Before establishing the objectives of the study, it is necessary to understand another important tool derived from NLP, which is the metamodel. It is a particular language model, which relates specifically to motor learning according to every sport. The various models that each of us create start from the experience and reality perceptions of each (Fanelli, 2010).

The subjectivity of reality depends on certain structural causes, their origin being neurological, social and individual. Draeger (2012) shows that mental training is based on knowledge, education and training.

Mental strategies have been suggested to be a promising approach to improve motor skills in athletes. This behavioral effect was shown to be associated with changes in neuronal activity in premotor areas not only during movement, but also while performing ideomotor representations with underlying trigger action time (Binder et al., 2014). The feedback in the communication process is very important, representing a retrospective that occurs in various systems (Pop, 2014), in our case the biological and psychological system.

When we ask our students to describe a motion, they are using a set of verbs that are not important to us and represent reality through a small linguistic structure. This is called a superficial structure and is the representation of the deep, complete structure (Fanelli, 2010), which in our case is motor learning.

We want to show that to achieve performance in any field, our attitude is very important (Gonzalez, 2013), which means that a conscious attitude will certainly lead to good results.

The research is part of a larger work, aimed at increasing sports performance by applying mental training techniques, in particular through sensory submodalities of neurolinguistic programming.

Hypothesis

Neurolinguistic programming through sensory submodalities helps improve ideomotor representations. As more words coming from multiple sensory registers are used by students, the sensory submodalities are more numerous and representations are complete and complex. In this way, they can be used more effectively in mental training, ideomotor representations helping to improve motor skills.

We assume that a good ideomotor representation can increase sport performance.

Material and methods

Research protocol

a) *Period and place of the research*

We received the approval from the Ethics Committee of the Babes-Bolyai University to conduct our research. We also obtained an informed consent of the subjects participating in the research.

The period of the survey was the second semester of the 2012-2013 academic year, during 30 days.

The research was conducted at the Faculty of Physical Education and Sport, University “Babes-Bolyai” from Cluj-Napoca, on graduate students from the department of training and sports performance (APS).

b) *Subjects and groups*

The subjects were 22 students with different specialties (10 female and 12 male) aged 23 to 35 years, former practitioners of different sports. The performance level of the subjects of this research was variable, and some of them practiced high performance sports. Absenteeism from the first or second test led us to continue our research for a reconfirmation of the results.

A single experimental group was used, consisting of master students from the Faculty of Physical Education and Sport, training and sports performance specialization.

c) *Tests applied*

In neurolinguistic programming, the relationships between sensory submodalities were studied by applying the following tests: Bandler & Thomson (2012) and Jacobson (2011).

After applying the two mentioned tests, records were made in two stages: initial (T1) and final (T2) at the beginning and at the end of the neurolinguistic-programming module.

For the initial and final testing, the master students were asked to consider three motor skills specific to their practiced sport and to complete the two tests - Bandler & Garner and Jacobson.

In neurolinguistic programming, Jacobson relaxation techniques were applied with an activation phase. The Jacobson relaxation techniques were applied between

Table I

Test moments I and II in the experimental group, master APS students (Bandler & Thomson and Jacobson tests).

No.	Name and surname	T_1		T_2		Motor act in ideomotor representation
		Bandler & Thomson	Jacobson	Bandler & Thomson	Jacobson	
1	BA	55	37	56	61	Football – leading the ball, gate completion
2	B P	24	26	0	0	Football – leading the ball - kick
3	C(J)A.M	36	77	48	91	Swimming - crawl 50 m
4	D.R	42	78	0	0	Football - technique
5	DG	0	0	39	88	Sky – oblique descent
6	FC	21	19	19	56	Swimming - backstroke learning
7	FL	23	110	64	120	Basketball - game
8	GD	53	75	42	129	Athletics - throwing, correcting some execution errors
9	IR	16	48	0	0	Football - dribbling, takeover, 4-4-2 system
10	MC	65	137	68	164	Football - tactical organization
11	MN	0	0	28	114	Volleyball
12	MM	28	64	53	136	Swimming crawl
13	MD	22	66	59	118	Speed running - 50 m
14	MA	18	96	0	0	Football
15	NV	31	34	0	0	Gymnastics - rolling
16	NA	32	26	42	66	Swimming - breast stroke 20 m
17	P S	33	16	0	0	Swimming
18	RM	47	98	0	0	Football – lace kick
19	SD	27	55	27	63	Field tennis – forehand, backhand
20	SK	0	0	43	111	Basketball
21	SR	52	69	43	94	Field tennis – serve (right, left), forehand, backhand
22	VN	24	77	56	177	Basketball - throwing the ball by jumping

the two tests. Focus was on keywords, triggers of action in the technique of each sport. We also insisted on the metalanguage of each sport.

The students completed in the tests all the sensations felt within the ideomotor representations, focusing on proprioception, which is according to Mauti (2012) the ability to feel and recognize their body position in space, giving particular attention to focusing on their muscles.

After one month there was a second test, in order to highlight correlations between sensory submodalities, finalizing the study *by the self-perception profile* of each student participating in the experiment, which was defined by Kenneth & Fox (2000).

Ideomotor mental representations of the training were made based on keywords (Grosu, 2012) and trigger motor actions. In sport, this technique is used to reduce blood pressure before competition and promoting overall physical and mental relaxation (Brugnoli, 2005).

d) *Statistical processing*

Statistical indicators were calculated, elements of descriptive statistics, the data are presented using indicators of centrality, location and distribution.

Statistical analysis: the Wilcoxon nonparametric test was used for paired samples (data uneven distribution/ranking) (Lupu & Zanc, 1999). To detect the correlation between two quantitative continuous variables, we used the Spearman rank correlation coefficient (ρ). The analysis of correlation coefficients was performed using Colton's rule (Lupu & Lupu, 2011). Polynomial regression was the method used to obtain the mathematical equation for the addition of one continuous variable to another variable. Statistical interpretation was performed with the Excel application (Microsoft Office 2007) and StatsDirect v.2.7.2 program. The graphical representation of the results was made with the Excel application (Microsoft Office 2007) (Table I).

Results

Table II shows the results of the three most important categories of sensations: visual, auditory, kinesthetic in the experimental group, for the Bandler & Thomson test, and Table III presents the results for the Jacobson test.

Table II

Initial and final testing using the Bandler & Thomson test.

No.	Name and surname	Visual sensations		Auditory sensations		Kinesthetic sensations	
		T_1	T_2	T_1	T_2	T_1	T_2
1	BA	21	20	18	17	16	19
2	B P	13	0	7	0	4	0
3	C(J)A.M	17	18	8	15	11	15
4	D.R	17	0	12	0	13	0
5	DG	0	19	0	10	0	10
6	FC	16	10	4	5	1	4
7	FL	12	25	6	20	5	19
8	GD	21	19	17	14	15	9
9	IR	11	0	4	0	1	0
10	MC	25	25	19	20	21	23
11	MN	0	17	0	10	0	1
12	MM	10	21	12	19	6	13
13	MD	4	22	10	18	8	19
14	MA	12	0	5	0	1	0
15	NV	13	0	17	0	1	0
16	NA	13	15	12	16	7	11
17	P S	25	0	7	0	1	0
18	RM	8	0	20	0	19	0
19	SD	12	16	8	5	7	6
20	SK	0	21	0	6	0	16
21	SR	16	18	17	12	19	13
22	VN	11	23	7	16	6	17

Table III

Initial and final testing using the Jacobson test.

No.	Name and surname	Visual sensations		Auditory sensations		Kinesthetic sensations		Olfactory/ gustatory sensations	
		T_1	T_2	T_1	T_2	T_1	T_2	T_1	T_2
1	BA	21	29	12	32	4	0	0	0
2	B P	14	0	8	0	4	0	0	0
3	C(J)A.M	22	31	23	26	28	32	4	2
4	D.R	30	0	16	0	22	0	10	0
5	DG	0	33	0	27	0	22	0	6
6	FC	7	19	7	17	3	16	2	4
7	FL	36	39	28	35	32	30	14	16
8	GD	29	43	23	33	14	35	9	18
9	IR	18	0	17	0	13	0	0	0
10	MC	43	54	32	40	42	52	20	18
11	MN	0	36	0	42	0	36	0	0
12	MM	18	46	19	29	21	44	6	17
13	MD	22	30	24	33	19	39	1	16
14	MA	32	0	27	0	23	0	14	0
15	NV	17	0	17	0	0	0	0	0
16	NA	12	18	6	13	6	24	2	11
17	P S	8	0	8	0	0	0	0	0
18	RM	31	0	28	0	28	0	11	0
19	SD	30	26	9	9	10	20	6	8
20	SK	0	27	0	38	0	34	0	12
21	SR	19	27	22	36	26	28	2	3
22	VN	26	47	18	51	25	61	8	18

To detect the correlation between two variables, we used the Spearman rank correlation coefficient (ρ). The analysis of correlation coefficients was performed using Colton's rule. No statistically significant differences were observed ($p > 0.05$) in the Bandler & Thomson and Jacobson tests for paired samples (T1-T2 moments), but there were many very good correlations in both studied tests between the values of the items, see table IV.

Discussions

By analyzing the items from the Bandler & Thomson test (visual, auditory, kinesthetic sensations) for paired samples, we found no statistically significant differences between the two moments ($p > 0.05$).

For the Jacobson test (visual, auditory, kinesthetic, olfactory/gustatory sensations) for paired samples, we found no statistically significant differences between the two moments ($p > 0.05$), see Figure no.1.

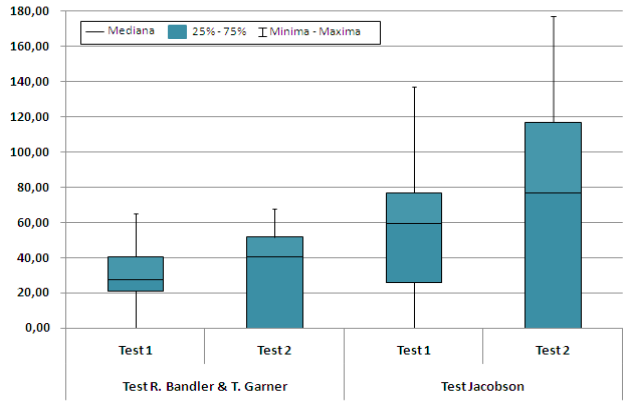


Fig. 1 – The values for T1 and T2 moments, for the studied tests.

Ready & Burton (2010) say that to see, hear, feel will make communication more efficient. Each and every one of us has a special communication channel to convince (Garratt, 2011) that we are understood when we are describing a movement.

At moment T1 for the Bandler & Thomson test, the statistical analysis of the studied items showed (Fig. 2):

- a very good positive correlation between SA - SK,
- a good positive correlation between SV - SA and SV - SK .

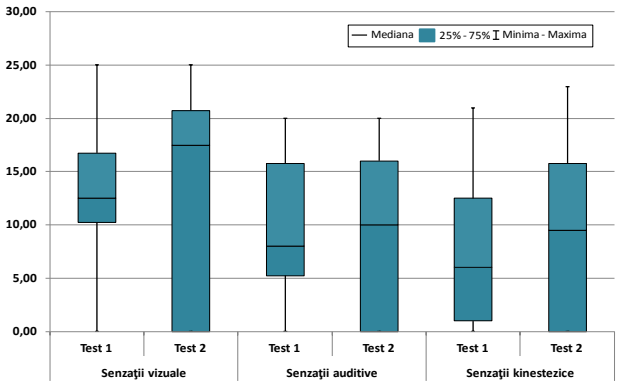


Fig. 2 – The values for T_1 and T_2 moments, for the Bandler & Thomson test.

For the Jacobson test, the statistical analysis of the studied items showed:

- a very good positive correlation between SV - SA, SV - SK, SV - SOG, SA - SK and SK - SOG,
- a good positive correlation between SA - SOG.

At moment T2 for the Bandler & Garner test, the statistical analysis of the studied items showed (Fig. 3):

- a very good positive correlation between SA - SK, SV - SA and SV - SK (SV - visual sensations, SA - auditory sensations, SK - kinesthetic sensations, SOG - olfactory/ gustatory sensations).

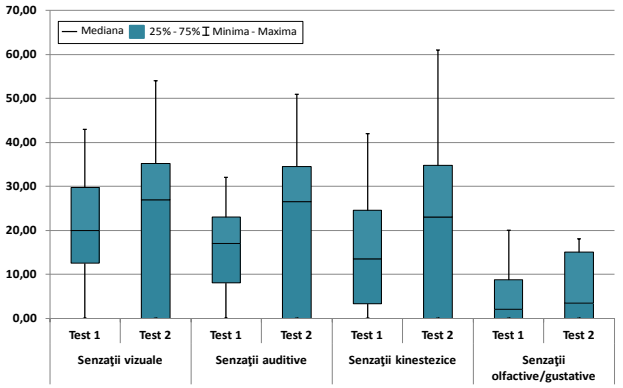


Fig. 3 –The values for T_1 and T_2 moments, for the Jacobson test.

Table IV

Comparative analysis of tested values and items and statistical significance (paired samples).

Test item	Moment	Mean	SE	Median	SD	Min.	Max.	Statistical significance (p)
Bandler & Thomson test	T1	29.50	3.7966	27.5	17.8078	0	65	0.7854
	T2	31.23	5.2541	40.5	24.6440	0	68	
Visual sensations	T1	12.59	1.5397	12.5	7.2221	0	25	0.7854
	T2	13.14	2.0747	17.5	9.7311	0	25	
Auditory sensations	T1	9.55	1.3544	8	6.3526	0	20	0.8987
	T2	9.23	1.6540	10	7.7578	0	20	
Kinesthetic sensations	T1	7.36	1.4867	6	6.9730	0	21	0.3535
	T2	8.86	1.7072	9.5	8.0077	0	23	
Jacobson test	T1	54.91	8.0531	59.5	37.7724	0	137	0.187
	T2	72.18	12.5202	77.0	58.7251	0	177	
Visual sensations	T1	19.77	2.5507	20	11.9640	0	43	0.4628
	T2	22.95	3.8716	27	18.1593	0	54	
Auditory sensations	T1	15.64	2.0895	17	9.8006	0	32	0.2877
	T2	20.95	3.6801	26.5	17.2612	0	51	
Kinesthetic sensations	T1	14.55	2.6966	13.5	12.6481	0	42	0.1327
	T2	21.50	4.1125	23	19.2892	0	61	
Olfactory/gustatory sensations	T1	4.95	1.2475	2	5.8511	0	20	0.2744
	T2	6.77	1.5831	3.5	7.4254	0	18	

Table V

Statistical correlation analysis between the studied items at the two test moments.

Test	Correlations between	T_1			T_2		
		ρ	Colton	*p*	ρ	Colton	*p*
Bandler & Garner	SV - SA	0.5078	***	0.0168	0.9103	****	< 0.0001
	SV - SK	0.5060	***	0.0174	0.9453	****	< 0.0001
	SA - SK	0.8685	****	< 0.0001	0.9249	****	< 0.0001
Jacobson	SV - SA	0.8568	****	< 0.0001	0.8699	****	< 0.0001
	SV - SK	0.8452	****	< 0.0001	0.8909	****	< 0.0001
	SV - SOG	0.8551	****	< 0.0001	0.7847	****	< 0.0001
	SA - SK	0.8659	****	< 0.0001	0.8592	****	< 0.0001
	SA - SOG	0.7334	***	0.0002	0.6713	***	0.0008
	SK - SOG	0.8346	****	< 0.0001	0.8377	****	< 0.0001

Legend: SV - visual sensations, SA - auditory sensations, SK - kinesthetic sensations, SOG - olfactory/gustatory sensations.

At moment T2 for the Jacobson test, the statistical analysis of the studied items showed (Table V):

- a very good positive correlation between SV - SA, SV - SK, SV - SOG, SA - SK and SK - SOG,
- a good positive correlation between SA - SOG.

Conclusions

1. All sensory submodalities are particularly important in achieving ideomotor representations, underlying the importance of mental training. If ideomotor representations are accompanied by many sensory submodalities, motor skills are richer and the motor skills specific to various sports are more complex.

2. Very good positive correlations between SV - SA, SV - SK, SV - SOG, SA - SK and SK - SOG show that the motor skill (profound structure) will be more complete if it is accompanied by its description and sensations.

3. As more words coming from various sensory registers are used by students, sensory submodalities increase and representations are more complete and complex; in this way, they can be used more effectively in mental training.

Proposals

Further research is required because the time difference between T1 and T2 was very small and we want to extend this study to a minimum of three months, during a semester. Modular lessons were made for objective reasons (space reconstruction in our faculty).

Conflicts of interests

Nothing to declare.

Acknowledgments

This work uses part of the results of the first author's ongoing PhD thesis. The other authors were involved in research on relaxation techniques and data collection.

Special thanks to the FEFS-APS master students who participated in this experiment.

References

Bandler R, Thomson G. PNL per il Benessere. Ed. Alessio Roberti, Roma, 2012.

Binder E, Hagelweide K, Wang LE, Kornysheva K, Grefkes C, Fink GR, Schubotz RI. Sensory-guided motor tasks benefit from mental training based on serial prediction. Neuropsychologia, 2014;54: 18-27.

Bläsing B, Tenenbaum G, Schack T. The cognitive structure of movements in classical dance. Psych. Sport & Exercise, 2009;10(3):350-360.

Brugnoli MP. Techniche di Mental Training nello sport. Vincere la tensione, aumentare la concentrazione e la performance agonistica. Red. Edizioni, Milano, 2005, 36-37.

Carey J, Churches R, Hutchinson G, Jones J, Tosey P. Neuro-linguistic programming and learning: teacher case studies on the impact of NLP in education, 2009, 31-32. Available online at: www.CfBT.com. Accessed on 05.07.2014

Draeger LNS. Training Guide: Mental Thoughness. GmbH Leipzig, Amazon Distr. 2012, 42.

Faelli V. Coaching e PNL, Strumenti della PNL per aumentare l'efficacia del coaching. Ed. My Life, Coriano di Rimini, 2010, 53-54. Available online at: www.edizionimylife.it. Accessed on 05.07.2014

Garratt T. PNL per lo Sport. Come allenare la mente per vincere con la programazzione neuro-lingvistica. Un'eccellente guida per migliorare la vostra performance sportiva. Ed. Alessio Roberti, Sporting Excellence - titolo dell' opera in lingua originale, Edit. Srl, Urgnano (BG), 2011, 130-138.

Gonzalez DC. The Art of Mental Training, A Guide to Performance Excellence. GonzoLane Media, Leipzig, 2013, 23.

Grosu EF. Aplicaţii ale antrenamentului mental în sport. Acţiune motorie versus acţiune psihică. Ed. GMI, Cluj-Napoca, 2012, 68.

Isidori E. Filosofia dell'educazione sportiva. Dalla teoria alla prassi. Ed. Nuova Cultura, Roma, 2012, 82.

Jacobson S. NLP per il problem solvine. Ed. Alessio Roberti, Roma, 2009.

Kenneth RF, Boutcher SH. Physical Activity and Psychological Well-Being, Ed. Routhledge, Taylor &Francis Group, London and New York, 2000, 90.

Lupu I, Lupu O. Introducere în psihologia Educaţională. Teorie şi instrumente de evaluare. Ed. Risoprint, Cluj-Napoca, 2011, 79.

Lupu I, Zanc I. Sociologie medicală. Teorie şi aplicaţii. Ed. Polirom, Iaşi, 1999.

Mauti E. Training autogeno, techiche, sequenze ed esercizi. Ed Giunti Demetra, Giunti Editore S.p.A. Firenze, 2012, 71. Available online at: www.giunti.it. Accessed on 03.07.2014

Pop CL. Comunicarea în educaţie fizică şi sport. Ed. ProUniversitaria, Bucureşti, 2014, 28.

Ready R, Burton K. Neuro-Linguistic Programming for Dummies, Making Everything Easier, 2nd Ed., Copyright John Wiley & Sons, Ltd., England, 2010, 89-104.

Weigelt M, Ahlmeyer T, Lex H, Schack T. The cognitive representation of a throwing technique in judo experts. Technological ways for individual skill diagnostics in high-performance sports. Psychol Sport Exer, 2011, 12:231e235.

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 238–245

REVIEWS
ARTICOLE DE SINTEZĂ

The importance of medical selection and orientation in sports
Importanţa selecţiei şi orientării medico-sportive

Teodora Alexescu[1], Vasile Negrean[1], Mircea Handru[2], Alina Tanţău[1], Ioana Para[1]
[1] "Iuliu Haţieganu" University of Medicine and Pharmacy, Cluj-Napoca, 4th Medical Clinic
[2] Clinical Rehabilitation Hospital Cluj-Napoca, Department of Occupational Medicine

Abstract

Sports selection, followed by sports orientation, tends to start from increasingly early ages, individually, based on the sports branch in question and the following selection criteria: genetic, morphological, functional, neuropsychological, biochemical. These criteria can be correctly assessed only by a close collaboration between the physician, coach and physical trainer, as well as including a good knowledge of scientific assessment criteria. First of all, a detailed general anamnesis is made, to which an initial, as well as periodic, sports medical anamnesis will be added. This is followed by the somatometric examination, which comprises the clinical, aesthetic, anthropometric and somatometric exams. The somatoscopic exam and the one assessing individual physical qualities complete the medical sports assessment. All these must be performed in order to achieve a complete and complex sports medical picture and to reach the final goal of scientifically based medical sports orientation for the individual, as well as to obtain performance at the highest levels.

Keywords: medical sports orientation, selection criteria.

Rezumat

Selecţia în sport, urmată de orientarea sportivă, tinde să înceapă la vârste din ce în ce mai timpurii, individual, în funcţie de ramura sportivă vizată, pe baza următoarelor criterii de selecţie: genetic, morfologic, funcţional, neuropsihic, biochimic. Aceste criterii pot fi apreciate corect doar printr-o strânsă colaborare medic-antrenor-preparator fizic şi printr-o bună cunoaştere a criteriilor ştiinţifice de evaluare. Se începe cu o anamneză amănunţită generală, la care se adaugă anamneza medico-sportivă, ce va fi atât iniţială, cât şi periodică. Se continuă cu examenul somatometric ce va cuprinde examenul clinic, examenul estetic, examenul antropometric şi examenul somatometric. Examenul somatoscopic şi cel prin care se face aprecierea calităţilor fizice individuale vin să completeze evaluarea medico-sportivă, pentru a reuşi să se efectueze o completă şi totodată complexă evaluare medico-sportivă, pentru a atinge scopul final de orientare medico-sportivă pe criterii ştiinţifice a individului şi a obţinerii de performanţe sportive la cele mai înalte niveluri.

Cuvinte cheie: orientare medico-sportivă, criterii de selecţie.

The importance of orientation and selection in sports

Biological selection and medical orientation in sports are important in order to obtain, though science, performance at the highest competitive levels. Sports selection starts early, depending on the sports branch, as early as the age of 5-6 years in gymnastics, swimming and skating. In other branches (most of them), the selection starts at the age of 10-11 years. In sports branches such as heavy athletics, boxing, rowing, the selection starts around the age of 12-13 years. In order to increase the predictability of selection, this should be based on a minimum of 3 scientific criteria: biomedical (or medico-biological, or medical), psychological and motor.

Sports orientation is a subsequent selection stage, based on the same scientific criteria, and the capacity of understanding sports competitiveness is not generally achieved before the age of 9 (Patel et al., 2002; Daniels, 2007; White et al., 1998).

Only starting with the age of 12 are most children neuro-psychologically developed enough in order to understand the complex sports tasks, as well as physically and mentally prepared to take part in competitive sports, under appropriate supervision (Patel et al., 2002; Daniels, 2007; White et al., 1998).

In Romania, because of the lack of an actual national data register and guides on how to record the students'

Received: 2014, May 21; *Accepted for publication:* 2014, July 10;
Address for correspondence: "Iuliu Haţieganu" University of Medicine and Pharmacy, Republicii Str. 18, PC 400015, Cluj-Napoca
E-mail: teodora.alexescu@gmail.com

sports qualities, only the motor component is usually taken into consideration, which leads to a very low predictability percentage of this selection stage.

In order to increase the predictability of selection, this should be based on scientific criteria.

Thus, medical orientation should go through several stages: sports medical anamnesis, somatometric exam, somatoscopic exam, physical quality assessment. Only in this way, is a favorable medical biological selection possible for proper sports orientation (White et al., 1998).

a) *Anamnesis*

It represents the starting point of any medical exam, therefore of the sports medical exam as well, being important in setting the sports medical diagnosis, as well as in making the initial sports selection, which could also undergo modifications along the way. Sports medical anamnesis has two components: general anamnesis and special anamnesis, which is specific for sports. Sports anamnesis is both initial and periodic. Initial anamnesis comprises the child's medical history, potential illnesses, as well as organic and/or functional sequelae, the child's motivation for sports, the parents' motivation, if the family had or has performance athletes. A separate talk with the parents is necessary in order to identify any element that might influence the athlete's future activity (White et al., 2004; Avramescu et al., 2006; Drăgan, 1989). The periodic sports medical anamnesis focuses on just two aspects: the medical evolution from the last checkup until the current day and the sports evolution (down to the smallest details) in the same time frame (an association of sports and medical evolution, through the athlete's vision) (Avramescu et al., 2006; Drăgan, 1989).

The assessment of physical development is done by the somatometric exam (paraclinical method of assessing physical development and nutrition status based on anthropometric measurements) and the somatoscopic exam (visual observation of the subject in order to assess composure, the general nutrition state, distribution of adipose tissue, muscle mass development, bone structure development, the presence of physical defects).

b) *The somatoscopic exam*

It consists of the frontal, dorsal and profile visual inspection of the subject's body, with the methodical inspection of global and segmental characteristics, statically and dynamically. Although subjective in its essence, somatoscopy, as it is predominantly carried out through the examiner's senses, has an outstanding importance in sports medicine, being the first component of the clinical exam. Rich in information, it allows a global and segmental assessment, despite not being expressed in concrete measurement units. Its results contribute to the individual's health status diagnosis, as well as physical and biomotor development (Avramescu et al., 2006; Drăgan, 1989).

The diagnosis of satisfactory, good or very good orthostatic, normotonic posture must be done according to the correctness of ratios between the segments, the body's balance in space according to the support polygon and gravitation line, represented by the line at the 0 (zero) point of the anthropometric frame. The qualities of orthostatic posture are: optimal, economical, esthetically vertical, ability for stato-kinetic and telekinetic practical performance (Avramescu et al., 2006; Drăgan, 1989).

c) *The somatometric exam*

It provides objective data on development, by direct measurement of the body size, through relatively simple measurements, with handy equipment (tape line, goniometer, mobility ladder, height and weight scales, dynamometer, myotonometer) and it allows to draw valuable conclusions. A quantified expression of the data can be carried out and, through statistical and mathematical processing, development standards are created (Avramescu et al., 2006; Drăgan, 1989).

The somatometric exam brings the following information of high practical utility:

- *Size* is 10 times more strongly influenced by heredity than by the environment. Generally, stature characterizes rather well the individual's development and it is the measurement to which all other anthropometric measurements can be compared. The scale of normal size spans between 135-190 cm, with variation in very tall statures, higher than 200 cm and very small ones, under 120 cm. In sports, the requirements are extremely different, from small statures in gymnastics to very high ones in basketball and high jump. It is important to know in which category the athlete fits at the time of selection. For this purpose, charts were created regarding the stature and weight based on age and gender, to help give the required answer, primarily taking into account the parents' statures.

- *The bust* represents the distance between the buttocks support plan and the top of the head, in the seated subject, back pressed against the height and weight scale rod. On an average, the bust represents 52% of the stature in males and 53% in females, with variations between 54.5-55% in both genders. Practically, the Adrian Ionescu index is used, as the following ratio: bust – stature/2, which in males is 5-6 cm, and in females 3-4 cm. The bust/stature ratio is very important in various athlete categories, where tall individuals must also have long lower limbs (high jumpers, 800-1500 m runners), or shorter lower limbs, with a lower center of gravity, for a higher stability in technical execution (hammer throwers, weightlifters) (Avramescu et al., 2006; Drăgan, 1989).

- *The arm span* is the distance between the right and left middle fingers, arms extended on the side at clavicle level. It is used in high performance sports, in direct connection with finalizing the sports effort. Its size must be at least equal with the stature, the characterization being: short, medium and long arms (exceptional values were recorded, up to +14 cm in comparison with the stature).

- *The biacromial width* represents the distance between the distal points of the acromion's outer edge. A high biacromial width is 39 cm in females and 43 cm in males, highly valued in body building and American football.

- *The bitrochanteric diameter* assesses the width of the pelvis and is measured in transverse plane on the antero-external edge of the greater trochanters. It could be slightly more difficult to measure in females, as the adipose tissue may mask it. It is generally 4-5 cm smaller than the biacromial width, though variations could be quite large. By comparing the 2 diameters, the athletic allure results (wide thorax, narrow pelvis), which is so much appreciated

in athletes; the maximal values are +10-12 cm and the hydrodynamic index (very valuable in swimming): J x 100 / stature, J being the ratio value (biacromial width + bitrochanteric diameter) / 2.

- *The thoracic circumference* is measured in antero-posterior and transversal plane and it assesses the individual's robustness. The transverse diameter is measured at the sternum and 4th rib level, dynamically, meaning in prolonged inspiration and expiration, in order to record an as great as possible differential. The antero-posterior diameter is also assessed dynamically, at sternum and anterior correspondence level. The transverse diameter value has to be at least 8 cm higher than the antero-posterior diameter; otherwise, it would be the case of a flat or cylindrical thorax.

- *The arm circumference*, of the left and right arms with the highest size, relaxed and in contraction, *the forearm circumference* under the elbow joint and with closed fist (for the upper limb) and *thigh circumference* relaxed and in contraction, *calf circumference* and *ankle circumference* also provide important anthropometric data, such as: data interpretation is done by estimating the absolute values (an arm with a circumference of 35 cm in women and 45 cm in men is a well-developed one, while a thigh with a 60 cm circumference is a strong one); it is also done through the relaxed-contracted difference, which should be as high as possible (differences as high as 8-10 cm were noted in bodybuilders). The thorax-stature circumference ratio is expressed by *the Erissman harmony index* (thoracic circumference – stature/2), which, in an adult, should have positive values. In children, the index has negative values, it is close to 0 around the age of 16-18 and it becomes positive in adult life. Generally, a negative Erissman index indicates an insufficiently developed thorax for an adult, while a high index could also be due to excessive adipose tissue on the torso (Avramescu et al., 2006; Drăgan, 1989).

- *Bone development* is assessed by measuring the fist circumference at the radial and cubital epiphysis, the knee circumference at the middle of the patella, the ankle circumference above the malleoli. The sum of these circumferences, compared to stature, results in an index of 45 in males and 44 in females, which allows the classification of individuals in 3 classes: small bone structure, with a bone index under 43, medium bone structure with an index between 43.5-45, strong bone structure with an index over 45.

- *The individual's weight* is easy to measure and it also provides information on the health status. The complete weighing of the individual is done in the morning, before eating, the subject being completely undressed. Assessing the weight status in an adult is done by calculating the body mass index, BMI = weight (kg)/height (m^2) (Alexescu et al., 2009; Tsigos et al., 2008) (Table I). In a young adult weighing 60 kg, the fixed part is approximately 20 kg and the variable part is approximately 40 kg (30 kg muscle mass and 10 kg fat) (Avramescu et al., 2006; Drăgan, 1989).

Table I

International classification of adult body weight according to BMI.

Classification	BMI (kg/m^2)
Underweight	<18.50
Normal weight	18.50 - 24.99
Overweight	25.00 - 29.99
Obesity	≥30.00
I degree obesity	30.00 - 34-99
II degree obesity	35.00 - 39.99
III degree obesity	≥40.00

(Alexescu et al., 2009; Tsigos et al., 2008)

- The calculation method of the *adipose tissue percentage* (AT%) is based on measuring 5 skin folds located on the abdomen, flank, back (under the scapula angle), brachial triceps and the anterior extremity of the thigh, all on the right side of the body. The calculation formula is the following:

AT (%) = (sum of 5 skin folds x 0.15) + 5.8 + BS (body surface)

Normally, the combined skin fold values should not go beyond +15 - +20 mm. In performance sports, the skin fold size can be: 2 mm for bodybuilders, 4-5 mm in gymnastics, 15-20 mm in weight and hammer throwers. The optimal value of adipose tissue is 11%-12%. We must take into account the fact that for an adult, 2 mm adipose tissue represent 1 kg weight (Avramescu et al., 2006; Drăgan, 1989).

We consider as very useful for specialists in sports medicine, school medicine, family medicine, etc. the presentation of tables with average data and normality indexes for height and weight in Romanian urban and rural environment (Tables I-IV) (Vlaicu, 2000).

Table I

Average data and normality indexes - Romania 1992, urban environment, height (cm).

Age	Sex	Mean	σ	Indices					
				Very low	Low	Medium		High	Very high
				M-3σ	M-2σ	M-σ	M+σ	M+2σ	M+3σ
New born	M	51.17	2.01	45.1	47.2	49.2	53.2	55.2	57.2
	F	50.63	2.04	44.5	46.6	48.6	52.7	54.7	56.8
1 year	M	74.31	3.52	63.8	67.3	70.8	77.8	81.4	84.9
	F	73.6	3.54	63.0	66.5	70.1	77.1	80.7	84.2
2 years	M	85.1	4.51	71.6	76.1	80.6	89.6	94.1	98.6
	F	84.14	4.44	70.8	75.3	79.7	88.6	93.0	97.5
3 years	M	94.01	5.26	78.2	83.5	88.8	99.3	104.5	109.8
	F	93.1	5.02	78.0	83.1	88.1	98.1	103.l	108.2
4 years	M	102.18	5.62	85.3	90.9	96.6	107.8	113.4	119.0
	F	101.09	5.63	84.2	89.8	95.5	106.7	112.4	118.0
5 years	M	108.68	5.64	91.8	97.4	103.0	114.3	120.0	125.6
	F	107.91	5.68	90.9	96.6	102.2	113.6	119.3	125.0
6 years	M	115.23	5.86	97.7	103.5	109.4	121.1	127.0	132.8
	F	114.26	5.91	96.5	102.4	108.4	120.2	126.1	132.0
7 years	M	122.04	6.29	103.2	109.5	115.8	128.3	134.6	140.9
	F	121.33	6.18	102.8	109.0	115.2	127.5	133.7	139.9
8 years	M	126.83	6.01	108.8	114.8	120.8	132.8	138.9	144.9-
	F	125.94	6.1	107.6	113.7	119.8	132.0	138.1	144.2
9 years	M	132.02	6.37	112.9	119.3	125.7	138.4	144.8	151.1
	F	131.56	6.76	111.3	118.0	124.8	138.3	145.1	151.8
10 years	M	137.51	6.89	116.8	123.7	130.6	144.4	151.3	158.2
	F	137.43	7.43	115.1	122.6	130.0	144.9	152.3	159.7
11 years	M	142.02	7.18	120.5	127.7	134.8	149.2	156.4	163.6
	F	142.74	7.94	118.9	126.9	134.8	150.7	158.6	166.6
l2 years	M	147.52	7.53	124.9	132.5	140.0	155.1	162.6	170.1
	F	149.71	7.83	126.2	134.1	141.9	157.5	165.4	173.2
l3 years	M	154.46	9	127.5	136.5	145.5	163.5	172.5	181.5
	F	155.39	7.59	132.6	140.2	147.8	163.0	170.6	178.2
14 years	M	161.97	9.08	134.7	143.8	152.9	171.1	180.1	189.2
	F	160.12	6.62	140.3	146.9	153.5	166.7	173.4	180.0
15 years	M	169.26	8.32	144.3	152.6	160.9	177.6	185.9	194.2
	F	161.77	6.31	142.8	149.2	155.5	168.1	174.4	180.7
16 years	M	172.81	7.19	151.2	158.4	165.6	180.0	187.2	194.4
	F	162.79	5.93	145.0	150.9	156.9	168.7	174.7	180.6
17 years	M	174.82	6.69	154.8	161.4	168.1	181.5	188.2	194.9
	F	163.15	5.96	145.3	151.2	157.2	169.1	175.1	181.0
18 years	M	176.21	6.52	156.7	163.2	169.7	182.7	189.3	195.8
	F	163.34	6.52	143.8	150.3	156.8	169.9	176.4	182.9

Table II

Average data and normality indexes - Romania 1992, urban environment, weight (kg).

Age	Sex	Mean	σ	Indices					
				Very low	Low	Medium		High	Very high
				M-3σ	M-2σ	M-σ	M+σ	M+2σ	M+3σ
New born	M	3.36	0.77	1.1	1.8	2.6	4.1	4.9	5.7
	F	3.21	0.41	2.0	2.4	2.8	3.6	4.0	4.4
1 year	M	9.9	1.08	6.7	7.7	8.8	11.0	12.1	13.1
	F	9.57	1.08	6.3	7.4	8.5	10.7	11.7	12.8
2 years	M	12.42	1.34	8.4	9.7	11.1	13.8	15.1	16.4
	F	11.97	1.32	8.0	9.3	10.7	13.3	14.6	15.9
3 years	M	14.27	1.6	9.5	11.1	12.7	15.9	17.5	19.1
	F	13.80	1.56	9:2	10.3	12.3	15.5	17.0	18.6
4 years	M	16.22	2.01	10.2	12.2	14.2	18.2	20.2	22.3
	F	15.78	2.02	9.7	11.7	13.8	17.8	19.8	21.8
5 years	M	18.12	2.32	11.0	13.5	15.8	20.4	22.8	25.1
	F	17.63	2.35	10.6	12.9	15.3	20.0	22.3	24.7
6 years	M	20.42	2.82	12.0	14,8	17.6	23.2	26.1	28.9
	F	19.77	2.81	11.3	14.2	17.0	22.6	25.4	28.2
7 years	M	23.07	3.55	12,4	16.0	19.5	26.6	30.2	33.7
	F	22.44	3.58	11.7	15.3	18.9	26.0	29.6	33.2
8 years	M	25.15	4.15	12.7	16.9	21.0	29.3	33.5	37.6
	F	24.31	4.07	12.1	16.2	20.2	26.4	32.5	36.5
9 years	M	27.92	4.83	13.4	18.3	23.1	32.8	37.6	42.4
	F	27.25	4.98	12.3	17.3	22.3	32.2	37.2	42.2
10 years	M	31.2	5.78	13.9	19.6	25.4	37.0	42.8	48.5
	F	30.83	6.31	11.9	18.2	24.5	37.1	43.5	49.8
11 years	M	33.98	6.36	14.9	21.3	27.6	40.3	46.7	53.1
	F	34.26	6.91	13.5	20.4	27.4	41.2	48.1	55.0
12 years	M	37.88	7.38	15.7	23.1	30.5	45.3	52.6	60.0
	F	39.05	7.66	16.1	23.7	31.4	6.7	54.4	62.0
13 years	M	43.05	8.81	16.6	25.4	34.2	51.9	60.7	69.5
	F	44.07	8.11	19.7	27.9	36.0	52.2	60.3	68.4
14 years	M	48.87	9.69	19.8	29.5	39.2	58.6	68.3	77.9
	F	48.8	7.88	25.2	33,0	40.9	56.7	64.6	72.4
15 years	M	54.85	9.53	26.3	35.8	45.3	64.4	73.9	83.4
	F	51.54	7.58	28.8	36.4	44.0	59.1	66.7	74.3
16 years	M	60.16	8.87	33.6	42.4	51.3	69.0	77.9	86.8
	F	53.39	7.03	32.3	39.3	46.4	60.4	67.5	74.5
17 years	M	63.16	8.59	37.4	46.0	54.6	71.8	80.3	88.9
	F	54.09	7.01	33.1	40.1	47.1	61.1	68.1	75.1
18 years	M	65.58	8.15	41.1	49.3	57.4	73.7	81.9	90.0
	F	55.01	7.22	33.4	40.6	47.8	62.2	69.5	76.7

Table III

Average data and normality indexes - Romania 1992, rural environment, height (cm).

Age	Sex	Mean	σ	Indices					
				Very low	Low	Medium		High	Very high
				M-3σ	M-2σ	M-σ	M+σ	M+2σ	M+3σ
New born	M	51.30	2.13	44.9	47.0	49.2	53.4	55.6	57.7
	F	50.44	2.32	43.5	45.8	48.1	52.8	55.1	57.4
1 year	M	74.52	4.63	60.6	65.3	69.9	79.2	83.8	88.4
	F	73.06	4.38	59.9	64.3	68.7	77.4	81.8	86.2
2 years	M	84.89	5.41	68.7	74.1	79.5	90.3	95.7	101.1
	F	83.83	5.49	67.4	72.9	78.3	89.3	94.8	100.3
3 years	M	93.80	6.03	75.7	81.7	. 87.8	99.8	105.9	111.9
	F	92.70	5.40	76.5	81.9	87.3	98.1	103.5	108.9
4 years	M	101.25	6.56	81.6	88.1	94.7	107.8	114.4	120.9
	F	100.03	6.67	80.0	86.7	93.4	106.7	113.4	120.0
5 years	M	107.22	6.27	88.4	94.7	101.0	113.5	119.8	126.0
	F	105.03	6.42	85.8	92.2	98.6	111.5	117.9	124.3
6 years	M	113.28	6.46	93.9	100.4	106.8	119.7	126.2	132.7
	F	112.21	6.77	91.9	98.7	105.4	119.0	125.8	132.5
7 years	M	119.35	6.25	100.6	106.9	113.1	125.6	131.9	138.1
	F	118.17	6.30	99.3	105.6	111.9	124.5	130.8	137.1
8 years	M	124.30	6.25	105.6	111.8	118.1	130.6	136.8	143.1
	F	123.25	6.50	103.8	110.3	116.8	129.8	136.3	142.8
9 years	M	129.26	6.46	109.9	116.3	122.8	135.7	142.2	148.6
	F	128.70	6.83	108.2	115.0	121.9	135.5	142.4	149.2
10 years	M	134.44	6.70	114.3	121.0	127.7	141.1	147.8	154.5
	F	133.87	6.99	112.9	119.9	126.9	140.9	147.9	154.8
11 years	M	139.38	7.18	117.8	125.0	132.0	146.6	153.7	160.9
	F	139.54	7.77	116.2	124.0	131.8	147.3	155.1	162.9
12 years	M	144.39	7.63	121.5	129.1	136:8	152.0	159.7	167.3
	F	145.94	8.09	121.7	129.8	137.9	154.0	162.1	170.2
13 years	M	150.03	8.34	125.0	133.4	141.7	158.4	166.7	175.1
	F	152.04	7.92	128.3	136.2	144.1	160.0	167.9	175.8
14 years	M	156.17	9.06	129.0	138.1	147.1	165.2	174.3	183.4
	F	156.06	7.24	134.3	141.6	148.8	163.3	170.5	177.8
15 years	M	160.75	8.68	134.7	143.4	152.1	169.4	178.1	186.8
	F	157.99	6.61	138.2	144.8	151.4	164.6	171.2	177.8
16 years	M	165.26	7.81	141.8	149.6	157.5	173.1	180.9	188.7
	F	160.23	6.16	141.8	147.9	154.1	166.4	172.6	178.7
17 years	M	167.31	7.37	145.2	152.6	159.9	174.7	182.1	189.4
	F	161.49	5.97	143.6	149.6	155.5	167.5	173.4	179.4
18 years	M	169.05	7.46	146.7	154.1	161.6	176.5	184.0	191.4
	F	162.15	6.06	144.0	150.0	156.1	168.2	174.3	180.3

Table IV

Average data and normality indexes - Romania 1992, rural environment, weight (kg).

Age	Sex	Mean	σ	Indices					
				Very low	Low	Medium		High	Very high
				M-3σ	M-2σ	M-σ	M+σ	M+2σ	M+3σ
New born	M	3.27	0.43	2.0	2.4	2.8	3.7	4.1	4.6
	F	3.25	0.65	1.3	2.0	2.6	3.9	4.6	5.2
1 year	M	9.75	1.20	6.2	7.4	8.6	11.0	12.2	13.4
	F	9.41	1.17	5.9	7.1	8.2	10.6	11..8	12.9
2 years	M	12.26	1.54	7.6	9.2	10.7	13.8	15.3	16.9
	F	11.89	1.42	7.6	9.1	10.5	13.3	14.7	16.2
3 years	M	13.98	1.73	8.8	10.5	12.3	15.7	17.4	19.2
	F	13.53	1.75	8.3	10.0	11.8	15.3	17.0	18.8
4 years	M	15.67	2.10	9.4	11.5	13.6	17.8	19.9	22.0
	F	15.34	2.18	8.8	11.0	13.2	17.5	19.7	21.9
5 years	M	17.38	2.54	9.8	12.3	14.8	19.9	22.5	25.0
	F	16.89	2.43	9.6	12.0	14.5	19.3	21.8	24.2
6 years	M	19.39	2.75	11.1	13.9	16.6	22.1	24.9	27.6
	F	18.77	2.93	10.0	12.9	15.8	21.7	24.6	27.6
7 years	M	21.71	3.18	12.2	15.4	18.5	24.9	28.1	31.3
	F	20.95	3.19	11.4	14.6	17.8	24.1	27.3	30.5
8 years	M	23.88	3.48	13.4	16.9	20.4	27.4	30.8	34.3
	F	23.05	3.55	12.4	16.0	19.5	26.6	30.2	33.7
9 years	M	26.32	3.99	14.4	18.3	22.3	30.3	34.3	38.3
	F	25.62	4.47	12.2	16.7	21.2	30.1	34.6	39.0
10 years	M	26.32	4.52	12.8	17.3	21.8	30.8	35.4	39.9
	F	28.25	4.84	13.7	18.6	23.4	33.1	37.9	42.8
11 years	M	31.97	5.30	16.1	21.4	26.7	37.3	42.6	47.9
	F	31.68	5.93	13.9	19.8	25.8	67.6	43.5	49.5
12 years	M	35.12	5.82	17.7	23.5	29.3	40.9	46.8	52.6
	F	36.28	6.94	15.5	22.4	29.3	43.2	50.2	57.1
13 years	M	39.55	7.05	18.4	25.5	32.5	46.6	53.7	60.7
	F	41.63	7.55	19.0	26.5	34.1	49.2	56.7	64.3
14 years	M	44.59	8.10	20.3	28.4	36.5	52.7	60.8	68.9
	F	46.03	7.79	22.7	30.5	38.2	53.8	61.6	69.4
15 years	M	49.67	8.38	24.5	32.9	41.3	58.1	66.4	74.8
	F	49.45	7.42	27.4	34.6	42.0	56.9	64.3	71.7
16 years	M	55.41	7.54	32.8	40.3	47.9	63.0	70.5	78.0
	F	52.96	6.64	33.0	39.7	46.3	59.6	66.2	72.9
17 years	M	58.68	7.34	36.7	44.0	51.3	66.0	73.4	80.7
	F	54.72	6.61	34.9	41.5	48.1	61.3	67.9	74.6
18 years	M	61.66	7.35	39.6	47.0	54.3	69.0	76.4	83.7
	F	56.03	6.72	35.9	42.6	49.3	62.8	69.5	76.2

Physical qualities

The physical (motor) qualities are assessed using specific methods.

Muscular strength – measured with dynamometers. It is expressed in kgf and it records the finger flexor strength, the pectoral arch strength and lumbar strength. The segmental strength index is calculated with the formulae:

- [(F1dr. + F1stg./2)]/Gx 100 for finger flexor strength, which is 60-70 in males and 50 in females;
- [F.sc./G] x 100 for pectoral arch strength, which is 50-60 in males and 40 in females;
- [F.lomb./G] x 100 for lumbar strength, which is 180 - 200 in males and 120-140 in females (Avramescu et al., 2006; Drăgan, 1989).

Mobility, tested with the mobility ladder, which emphasizes the anterior mobility of the lumbar spine. Muscular elasticity results from the difference of muscular circumferences in relaxed and contracted state in the upper and lower limbs, the differences in the thorax circumference while inhaling and exhaling, as well as at abdomen level (Avramescu et al., 2006; Drăgan, 1989).

Muscle tone is assessed at the level of larger limb muscle mass, while resting and in maximum contraction. The Szimayer myotonometer records values of 60-70 in relaxation and 140-150 in contraction (Avramescu et al., 2006; Drăgan, 1989).

Joint mobility is assessed in each of the big joints with the goniometer; in athletes it can have very good values, but it generally diminishes with age. We must also make a difference between joint mobility and joint laxity (Avramescu et al., 2006; Drăgan, 1989), a quality which is

very appreciated in rhythmic gymnastics.

The speed of an individual mostly depends on heredity, and it can only be "educated" to a very small extent. Speed, measured with the chronometer, can be characterized through several qualities: reaction, execution, repetition, movement; there are several exercises for increasing these types of speed, so necessary in individual sports (athletics, judo, boxing, wrestling), and also, in team sports (football, handball, basketball) (Avramescu et al., 2006; Drăgan, 1989).

Motor coordination or *dexterity* represents the capacity to execute the necessary movements in a correct, fast manner, adapted to the situation. It is a necessary quality in any field, especially in those with practical applicability, such as performance sports. Dexterity represents a sum of qualities which interfere with all the other qualities. If by the age of 12-14 years old, an individual does not show a certain dexterity for a motor activity, it is most unlikely they will later acquire it. As it is a complex quality, dexterity has no methods, methodical procedures or special qualities and it can only be subjectively measured (Avramescu et al., 2006; Drăgan, 1989).

Endurance is the body's capacity to perform an activity for a long time without diminishing efficacy. It is assessed in three ways: long term endurance (8-10 min.), medium term endurance (between 2-8 min.), short term endurance (45 sec. – 2 min.). Endurance is a slightly perfectible motor quality, through sustained and well scientifically researched training (Avramescu et al., 2006; Drăgan, 1989).

Thus, the medical biological selection and sports orientation can be carried out based on several criteria:

- The sanogenic criterion, which must be closely abided by, especially in primary selection. The following will be excluded from selection: cardiovascular diseases (even compensated), congenital anomalies, neuroendocrine diseases with or without behavioral disorders, rheumatic diseases, tuberculosis or acute viral hepatitis, renal diseases and sequelae, blood diseases, severe hearing and vision impairments, severe physical defects etc. (Drăgan, 1989).

- The genetic criterion, based on the genetic gender diagnosis. At several Olympic Games and world championships a few cases of genetic gender were encountered in female athletes, even in the absence of transgender situations. This led to the mandatory implementation of a genetic gender exam for winners in the Olympic Games or world championships (Drăgan, 1989). Recently, in 2013, a group of Australian scientists perfected a genetic test which proves or not the presence of a variant of the ACTN3 gene (R577X variant). This gene normally produces the actinin-3 protein, which contributes to the formation of rapid contraction muscular fibers, which are precisely those fibers used in intense efforts, such as athletic sprint events or bodybuilding. An individual which has no copy of the R577X variant may well have better than average results in sprint events or force sports, such as judo. Also, through a higher percentage of rapid contraction muscle fibers, the individual might have better results in bodybuilding. On the other hand, a person with two copies of this gene should do better in endurance sports, while a person with a copy of each variant should be placed somewhere between the two extremes. For now, these tests cause a lot of ethical controversy and they should be used and interpreted in a very discerning way (1).

- The morphological criterion in the performance selection is a true indicator, which both biologists and teachers use in sports selection. A certain constitution biotype could prove unfavorable in a certain sports event, on a biological level. This is why during the medical sports examination, it is necessary to mention the relation between the constitution type, established following the investigations, and the sports event in question: constitution biotype favorable (unfavorable) for the sports event (Drăgan, 1989).

- The functional criterion reflects more the effect of training rather than the consequence of genetic factors. Motor indicators: speed, strength, endurance, mobility, which belong to the coach and the teacher. The sports physician parallels these indicators with the physiological base, which is objective. Usually, the coach carries out a pre-selection, using the chronometer, the "eye", the tape line and the weight, which then later the physician consolidates, confirming it or ruling it out, by running a complex set of tests (Avramescu et al., 2006; Drăgan, 1989).

- The neuro-psychological criterion takes into account the psychogenic type, motivation for sports, the parents' psycho-physical aspect, psycho-reactivity, focused attention, stress coping, excitability, intelligence level (IQ). (Avramescu et al., 2006; Drăgan, 1989).

- The biochemical criterion considers a biochemical profile that might be favorable for a certain sport. For instance, those with high testosterone levels lean towards strength sports (weight lifting, bodybuilding), while those with high hemoglobin levels lean towards endurance sports (marathon, semi-marathon) (Drăgan, 1989).

Discussions

Global concerns on medical orientation at increasingly younger ages towards practicing certain sports have been relatively few in the last years, Romania not having, unfortunately, a standardized system to be applied by sports physicians.

In 2001, the Sports Medicine and Fitness Committee and the School Health Committee published the guidelines of the American Academy Association of Pediatrics for optimization and safety of children and teenagers in sports practice. These guidelines show how pediatricians can assess a child's capacity of practicing sports, their availability, how to minimize risks and maximize performance.

Moreover, through standard measurements on the aforementioned anthropometric indexes applied to children, one could also establish the health status and need to practice sports at population level. In a 2010 study, carried out on a group of children aged between 7 and 15 years, the authors drew the conclusion that sedentariness was correlated with female gender, obesity and abdominal circumference (Andreasi et al., 2010; Andersen, 2009; Ruiz et al., 2006).

In a pilot study published in 2009, it is shown that gender, the type of sports and competitive level are important factors to be taken into account when studying

the ways in which athletes define their own success or failure (Hanrahan & Cerin, 2009; Hanrahan et al., 2003; Hanrahan & Biddle, 2002), providing us with a few practical conclusions: male athletes should be encouraged to define their success in terms of improving their own performances, rather than just being better than the others; athletes practicing individual sports could also need to be convinced that success should be about acquiring new skills and improving the old ones; athletes practicing team sports should want to improve their own physical and sport qualities and admit that these can contribute to the success or failure of the entire team (Hanrahan & Cerin, 2009; Hanrahan et al., 2003; Hanrahan & Biddle, 2002; Papaioannou et al., 2007; Hanrahan & Gross, 2005).

Studies regarding sports orientation are in full swing in various sports, being aimed at finding exploration and integration methods from as early as possible ages. For instance, a 2013 study's conclusion is that children under the age of 11 cannot assess curved trajectories, unlike teenagers and adults (Brunet et al., 2007; Belmonti et al., 2013; Assaiante et al., 2005). The anticipation of turning the head and assessing the trajectory is developed late during childhood, while navigation skills, such as planning the itinerary and getting from egocentric reference to allocentric reference, are acquired late in the development of the control motor system; thus, the critical age to consolidate and acquire navigation skills is around the age of 9-10 years old. However, further studies are necessary (Brunet et al., 2007; Belmonti et al., 2013; Assaiante et al., 2005; Hicheur et al., 2005).

A comparative study on several anthropometric parameters between professional triathlon athletes and Sports and Physical Education students revealed that there were no significant differences between the two groups in terms of arm circumference, length of lower limbs, abdominal circumference or thigh circumference (Brunkhorst & Kielstein, 2013; McLean & Parker, 1989; Campion et al., 2010). As expected, performance athletes had a lower heart rate and body weight that the control group. Moreover, the cyclists of this group had a higher BMI, bigger thighs and were taller than triathletes, these measurements not having a higher impact on performance than individual training (Brunkhorst & Kielstein, 2013; Landers et al., 2000; Knechtle et al., 2007).

In 2014, a group of Swiss researchers published data on gender differences regarding some anthropometric qualities of professional swimmers: the age of male freestyle swimmers is higher by 2 years than that of females, age that is rising with the event distance in females, but not in males; female swimmers seem to obtain the fastest swimming speeds on short distances earlier in their age (~ 20-21 years), in comparison with long distances (~ 25-27 years); male freestyle swimmers seem to reach the highest speed between 22-27 years; moreover, gender does not influence the swimmer's speed at various length categories of an event (Rüst et al., 2014; Buhl et al., 2013; Donato et al., 2003; Vaso et al., 2013).

USA, the country with the highest interest in individual and national health, provides us with detailed maps/charts according to age and gender, referring to the individual's harmonious physical development until the age of 20 years. The charts were put together by the Centers for disease control and prevention - CDC (2).

These charts were created in order to enable to assess the health status of the school and preschool child, but they can also be applied by sports physicians to find those individuals with the right genetic load and family medical history, with the physical qualities necessary for performance sports. For instance, if following the physical exam, a child with a height above the 90th percentile is found, the child can be directed towards sports such as basketball, high jump; if, however, the height is below the 30th percentile, the child can be directed towards rhythmic gymnastics, weight lifting, judo, according to the child's bio-psychological qualities and their desire to practice sports. For those that are interested, the site provides numerous charts regarding all of the individual's physical qualities until the age of 20, with gender differences and possibility for exhaustive interpretation, thus giving an important technical support for those interested in professional activity: school and preschool physicians, GPs, sports physicians.

The clinical charts have scaled grids (kg, cm), with units in English (lb, in). The clinical diagrams are available for boys and girls. Of all the available clinical charts, we select those on monitoring the stature, weight and BMI according to age, which target children and teenagers aged 2-20 (Fig. 5-8).

It is desirable to carry out a research to render the CDC charts compatible, with the purpose of adapting them to the Romanian population.

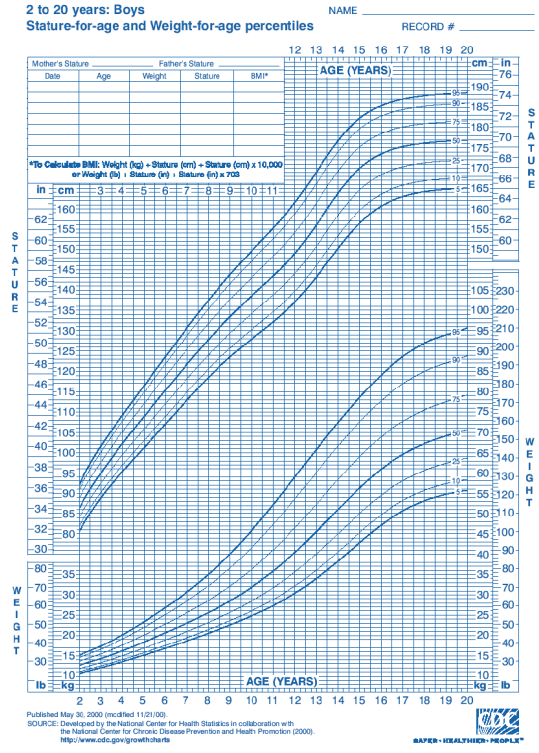


Fig. 5 – Stature according to age and weight - 2-20 year-old boys.

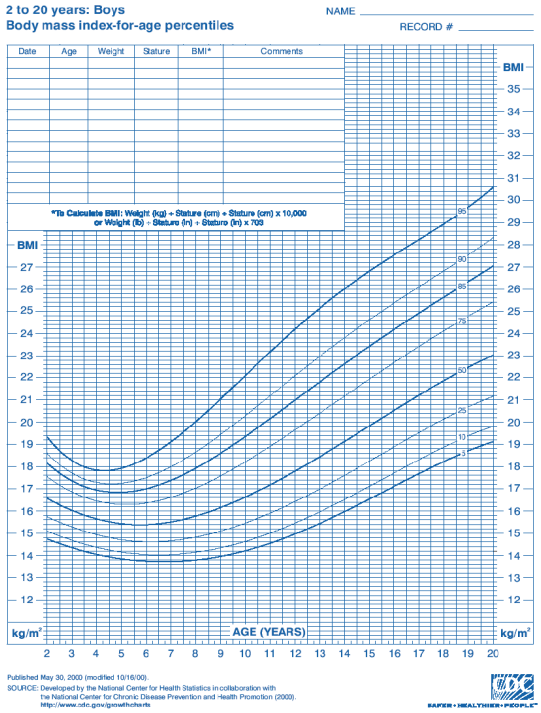


Fig. 6 – Body mass index - 2-20 year-old boys.

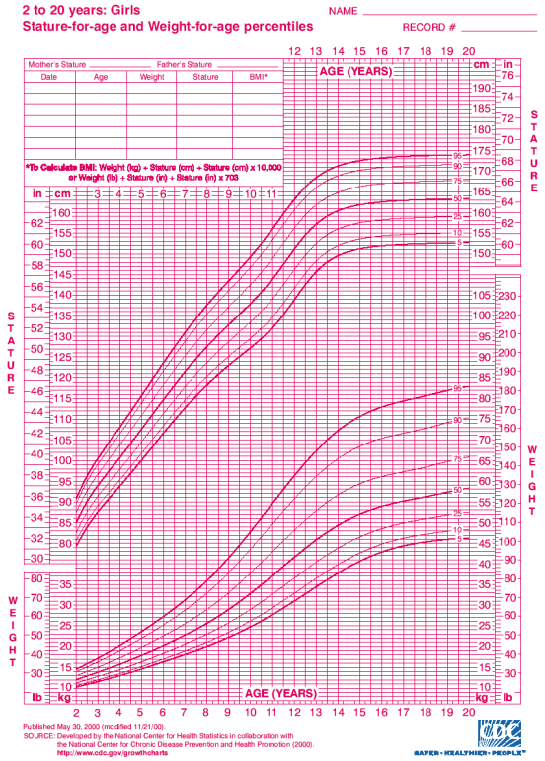


Fig. 7 – Stature according to age and weight - 2-20 year-old girls.

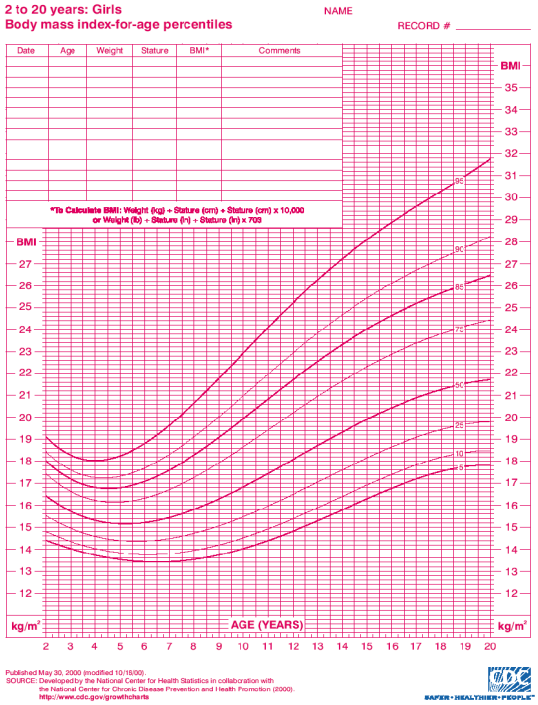


Fig. 8 – Body mass index - 2-20 year-old girls.

Conclusions

1. Sports medical orientation is a complex system that could mainly be applied to children, but can be extended to any sports age.

2. Sports medical orientation operates with objective indicators in order to emphasize that particular biological potential which, under scientific training, could lead to sports performance, under the conditions of no negative interference from growing, schooling and sanogenesis.

3. In Romania, there is no updated national register on the bio-psycho-motor qualities of school and pre-school children, which are so necessary for trainers in order to recruit future athletes on a scientific basis.

4. The lack of national guides eligible for sports physicians leads to a decrease of sports performance. In daily practice, sports physicians could turn to international guides and assess the physical qualities of an individual based on existing annexes, in order to guide them towards a certain sport.

Conflicts of interest

Nothing to declare.

References

Alexescu T, Motocu M, Negrean V, Ţărmure S, Lencu M. Obezitatea şi sindromul metabolic. Epidemiologie şi etiopatogenie. Clujul Medical, 2009; 82 (3):353-359.

Andersen LB. Physical activity in adolescents. J Pediatr (Rio J). 2009;85:281-283.

Andreasi V, Michelin E, Rinaldi AE, Burini RC. Physical fitness and associations with anthropometric measurements in 7 to 15-year-old school children. J Pediatr (Rio J). 2010;86(6):497-502.

Assaiante C, Mallau S, Viel S, Jover M, Schmitz C. Development of Postural Control in Healthy Children: a Functional

Approach. Neural Plast. 2005;12:109-118.
Avramescu ET (coord). Kinetoterapia în activităţi sportive. Vol. II. Ed. Didactică şi Pedagogică, Craiova, 2006,15-28;105-120.
Belmonti V, Cioni G, Berthoz A. Development of anticipatory orienting strategies and trajectory formation in goal-oriented locomotion. Exp Brain Res. 2013;227:131-147.
Brunet M, Chaput JP, Tremblay A.The association between low physical fitness and high body mass index or waist circumference is increasing with age in children: the 'Québec en Forme' Project. Int J Obes (Lond). 2007;31:637-643.
Brunkhorst L, Kielstein H. Comparasion of anthropometric characteristics between professional triathlets and cyclists. Biol. Sport. 2013;30:269-273.
Buhl C, Knechtle B, Rüst CA, Rosemann T, Lepers R. Women achieve peak swim performance in individual medley at earlier ages than men. Medicina Sportivă. 2013;17:54-59.
Campion F, Nevill AM, Karlsson MK et al. Bone status in professional cyclists. Int. J. Sports Med. 2010;31:511-515.
Daniels AM. Cooperation versus competition: is there really such an issue? New Dir Youth Dev. 2007;(115):43-56, 6-7.
Donato AJ, Tench K, Glueck DH, Seals DR, Eskurza I, Tanaka H. Declines in physiological functional capacity with age: a longitudinal study in peak swimming performance. J Appl Physiol. 2003;94:764-769.
Drăgan I (coord). Selecţia şi orientarea medico-sportivă. Ed . Sport Turism, Bucureşti, 1989.
Hanrahan SJ, Biddle SJH. Measurement of achievement orientations: psychometric measures, gender, and sport differences. Eur J Sport Sci. 2002;2(5):1-12.
Hanrahan SJ, Cerin E, Hartel C. Achievement goal orientations, attributional style, and motivational climate as predictors of performance and persistence. In: Proceedings of the Association for the Advancement of Applied Sport Psychology Annual Conference, 2003.
Hanrahan SJ, Cerin E. Gender, level of participation, and type of sport: Differences in achievement goal orientation and attributional style. J of Sci Med. in Sport. 2009; 12:508-512.
Hanrahan SJ, Gross J. Attributions and goal orientations in masters athletes: Performance versus outcome. Revista de Psicologia del Deporte. 2005;14(1):43-56.
Hicheur H, Vieilledent S, Berthoz A. Head motion in humans alternating between straight and curved walking path: combination of stabilizing and anticipatory orienting mechanisms. Neurosci Lett. 2005; 383:87-92.
Knechtle B, Knechtle P, Andonie JL et al. Influence of anthropometry on race performance in extreme endurance triathletes: World Challenge Deca Iron Triathlon 2006. Br. J. Sports Med. 2007;41:644-648.
Landers GJ, Blanksby BA, Ackland TR et al. Morphology and performance of world championship triathletes. Ann. Hum. Biol. 2000;27:387-400.
McLean BD, Parker AW. An anthropometric analysis of elite Australian track cyclists. J. Sports Sci. 1989;7:247-255.
Papaioannou AG, Milosis D, Kosmidou E, Tsigilis N. Motivational climate and achievement goals at the situational level of generality. J App Sport Psychol. 2007;19:38-66.
Patel DR, Pratt HD, Greydanus DE. Pediatric neurodevelopment and sports participation. When are children ready to play sports? Pediatr Clin North Am. 2002;49(3):505-531.
Ruiz JR, Rizzo NS, Hurtig-Wennlof A, Ortega FB, Warnberg J, Sjostrom M. Relations of total physical activity and intensity to fitness and fatness in children: the European Youth Heart Study. Am J Clin Nutr 2006;84:299-303.
Rüst CA, Rosemann T, Knechtle B. Sex difference in age and performance in elite Swiss freestyle swimmers competing from 50 m to 1,500 m. SpringerPlus. 2014;3:228-237.
Tsigos C, Hainer V, Basdevant A et al. Management of obesity in adults: European clinical practice guidelines. Obesity Facts, 2008;1(2):106-116.
Vaso M, Knechtle B, Rüst CA, Rosemann T, Lepers R. Age of peak swim speed and sex difference in performance in medley and freestyle swimming – a comparison between 200 m and 400 m in Swiss elite swimmers. J Hum Sport Exercise. 2013;8:954-965.
White SA, Duda JL, Keller MR.The relationship between goal orientation and perceived purposes of sport among youth sport participants. J Sport Behav, 1998;21(4):474-483.
White SA, Kavussanu M, Tank KM, Wingate JM. Perceived parental beliefs about the causes of success in sport: relationship to athletes' achievement goals and personal beliefs. Scand J Med Sci Sports. 2004;14(1):57-66.
Vlaicu, B. Elemente de iugiena copiilor şi adolescenţilor. Ed. SOLNESS. Timişoara, 2000
***. Committee on Sports Medicine and Fitness and Committee on School Health. Organized Sports for Children and Preadolescents. Pediatrics, 2001;107(6):1459-1462.
***. American Academy of Pediatrics, Committee on Sports Medicine and Fitness. Physical fitness and the schools. Pediatrics. 2000;105:1156-1157.

Websites

(1) http://www.nutritiesportiva.ro/medicina_sportiva/12testele_genetice.html, 2013. Accessed on March 2014
(2) http://www.cdc.gov/growthcharts/2000growthchart-us.pdf, 2001. Accessed on March 2014

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 246–249

Digestive disorders in athletes
Tulburări digestive la sportivi

Olga Orăşan[1], Bogdan Mărcuş[2], Ioana Miclea[3], Angela Cozma[1], Aniela Pop[4], Vasile Negrean[1]
[1] 4th Medical Department, "Iuliu Haţieganu" University of Medicine and Pharmacy, Cluj-Napoca
[2] 1st Medical Department, "Iuliu Haţieganu" University of Medicine and Pharmacy, Cluj-Napoca
[3] Heart Institute, "Iuliu Haţieganu" University of Medicine and Pharmacy, Cluj-Napoca
[4] Rehabilitation Clinic, "Iuliu Haţieganu" University of Medicine and Pharmacy, Cluj-Napoca

Abstract

Physical activity has positive and negative effects on the health status in general and on the digestive organs in particular. Sustained physical effort may cause digestive tract maladies.

The incidence of digestive tract diseases in athletes is 20-68%. It depends on the type of sport: for example, runners present digestive disorders more often than cyclists and these disorders appear in triathlon athletes more frequently during the running event. Digestive maladies triggered by physical activity are seen mostly in women and young people, especially when the exercises are done 2-3 hours after eating, and are increased by dehydration.

The most encountered gastrointestinal disorders in athletes are transient abdominal pain, gastroesophageal reflux disease, abdominal discomfort with vomiting, acute diarrhea, upper and lower gastrointestinal bleeding, intestinal ischemia and gastrointestinal infections. Among these disorders, abdominal pain is the most frequent.

Keywords: digestive disorders, athletes.

Rezumat

Activitatea fizică are efecte pozitive şi negative asupra stării de sănătate în general, şi asupra organelor digestive în particular. Efortul fizic susţinut poate cauza afecţiuni ale tractului digestiv.

Afecţiunile digestive se întâlnesc la sportivi cu o incidenţă de 20-68%. Incidenţa diferă în funcţie de tipul sportului practicat, astfel alergătorii prezintă mai frecvent decât cei care practică ciclismul tulburări digestive, la sportivii care practică triatlon aceste acuze apar mai des în timpul probei de alergare. Afecţiunile digestive declanşate de practicarea sportului sunt mai frecvente la femei şi la tineri, mai ales atunci când exerciţiile sunt efectuate la 2-3 ore după masă şi sunt accentuate de deshidratare.

Tulburările digestive la sportivi sunt durerea abdominală tranzitorie, boala de reflux gastroesofagiană, discomfortul abdominal şi voma, diareea acută, hemoragia digestivă superioară şi inferioară, ischemia intestinală şi infecţiile gastrointestinale. Dintre acestea, durerea abdominală este cea mai frecventă.

Cuvinte cheie: afecţiuni digestive, sportivi.

Introduction

Over the past decades, a large part of the global population has adopted a sedentary lifestyle, with important repercussions on the health state. A person is considered sedentary if he or she does not perform light physical exercise for at least 30 minutes, 5 days a week, or intense physical exercise for 20 minutes, 3 days a week. Over the past two decades, the number of sedentary persons has decreased; however, studies show that approximately 40% of the earth's population lives a sedentary life (Cordero et al., 2014).

Lately, sport has become an increasingly popular passion, particularly in West European countries. The practice of a sport has many beneficial effects on the organism: prevention of cardiovascular diseases, diabetes mellitus, obesity, constipation, and cancer, particularly in the gastroenterological area. In addition to these beneficial effects, a multitude of gastroenterological disorders, such as pyrosis, vomiting, abdominal pain, meteorism, flatulence, watery diarrhea, digestive hemorrhage, anal incontinence occur, all in direct relation with the intensity and duration of training (Gil et al.,1998; Thalmann et al., 2006; Peters et al., 2001).

The incidence of gastrointestinal symptoms varies between 25-60%, being dependent on several factors including age, sex, duration and intensity of training, or diet. The most affected athletes have proved to be participants in the marathon and triathlon. Triathlon athletes report gastrointestinal disorders much more frequently during the

Received: 2014, May 3; *Accepted for publication:* 2014, August 15;
Address for correspondence: "Iuliu Haţieganu" University of Medicine and Pharmacy, Republicii Str. 18, PC 400015, Cluj Napoca
E-mail: olgaorasan@yahoo.com

running event compared to the cycling or swimming event (Kwon & Lamont, 2013; Sullivan, 1987).

The exact mechanisms that determine the appearance of gastrointestinal symptoms in athletes are not completely understood. A number of triggering factors are suspected, which include the decrease of mesenteric blood flow, the alteration of gastrointestinal perfusion and permeability, neuroendocrine changes, intestinal motility disorders due to diet, mechanical trauma and hypertrophy of the psoas muscle with compression of the transverse colon (Dimeo et al., 2004; Rao et al., 2004).

The most frequent complaints reported by marathon runners are specific to lower gastrointestinal disorders and consist of diarrhea, anal incontinence and abdominal pain. Upper gastrointestinal involvement (pyrosis, nausea and vomiting) is less common (Sullivan, 1987; Keeffe et al., 1984).

Transient abdominal pain

It is one of the most frequent symptoms described by athletes. One third of long-distance runners, particularly inadequately trained young athletes, complain of transient abdominal pain related to the performance of physical exercise (Dimeo et al., 2004; Morton & Callister, 2000). It is described as transient stabbing or cramping pain, with onset during exercise, more frequently located in the flanks and more rarely in the right or left hypochondrium (Dimeo et al., 2004; Morton & Callister, 2000).

The pathogenesis of abdominal pain is not very well known. Symptoms occur during physical exercise, while during rest the athlete is asymptomatic. Several mechanisms are suspected, which include the mechanical trauma and injury of the intestinal mucosa, the increased mobilization of the kidneys during ampler respiration in exercise, bloating, intestinal spasm, abdominal muscle cramps, intestinal motility disorders and decrease of splanchnic blood flow (Kwon & Lamont, 2013; Dimeo et al., 2004). Dimeo et al. noted that the mechanical stimulation of the intestinal mucosa during running induces the release of prostaglandins and vasoactive peptides from the intestine, which cause in turn intestinal muscle contraction with secondary abdominal pain (Dimeo et al., 2004).

This symptom is generally completely eliminated by the cessation of physical exercise or the reduction of its intensity. Some procedures have proved to be less effective: the leaning forward of the body and the tensing of abdominal musculature or deep inspiration followed by expiration with the mouth almost closed (Kwon & Lamont, 2013; Dimeo et al., 2004; Plunkett & Hopkins, 1999).

Gastroesophageal reflux

Intense physical exercise favors gastroesophageal reflux. The most frequent symptoms reported by athletes are pyrosis and regurgitation in a 10% proportion (Peters et al., 1999). The incidence is much higher in long-distance runners compared to cyclists. Collings et al. evidenced that gastroesophageal reflux disease is much more frequent in weight lifters compared to runners or cyclists (Peters et al., 1999).

A direct mechanism for the development of gastroesophageal reflux in athletes is not known, but the reduction of splanchnic blood circulation, an increased relaxation of the lower esophageal sphincter and a decrease of esophageal clearance are considered to be involved. The type of exercise and fluid or food intake before or during physical exercise seem to be among the most important triggering factors (Peters et al., 1999; Parmelee & Moeller, 2004).

Clark et al. demonstrated the presence of longer gastric reflux periods at the level of the esophagus during long-distance running events and in athletes performing sports events postprandially (Peters et al., 1999). Kraus et al. noted that the administration of 300 mg ranitidine one hour before physical exercise reduces the frequency and duration of reflux episodes in athletes (Peters et al., 1999). In another study carried out in runners, proton pump inhibitors were administered and the decrease in the frequency and duration of reflux symptoms was recorded by esophageal pH-metry (Peters et al., 1999).

Nausea and vomiting

Nausea is much more frequent in runners compared to vomiting; up to 26% of athletes complain of this symptom during physical exercise. The etiology of nausea and vomiting induced by exercise is similar to that of gastroesophageal reflux and refers to the alteration of intestinal motility and the delay of gastric emptying (Kwon & Lamont, 2013; Sullivan, 1987; Plunkett & Hopkins, 1999; Murray, 1987). Dehydration and water electrolyte imbalance caused by intense physical exercise enhance these symptoms (Kwon & Lamont, 2013).

For prevention, it is recommended to avoid the consumption of hyercaloric and fat-rich food approximately three hours before competition. The main treatment for stopping nausea and vomiting is the reduction or cessation of physical exercise and adequate hydration (Kwon & Lamont, 2013).

Acute diarrhea

Diarrhea, along with the imperative sensation of defecation, are very frequent in athletes participating in endurance events (marathon or triathlon), with a higher incidence in female athletes (Sullivan, 1987; Rao et al., 2004). It is suggested that the diarrrheal syndrome occurs because of the association of a number of factors such as pre-competition stress, a high intensity of physical exercise and eating before competition (Kwon & Lamont, 2013; Sullivan, 1987).

Several mechanisms involved in the etiology of this disorder are under discussion: mesenteric ischemia, mechanical trauma, physical and mental stress, alteration of intestinal absorption or permeability, neuroendocrine disorders. The alteration of the intestinal tract motility is considered to be the main factor (Kwon & Lamont, 2013; Rao et al., 2004). Rao et al. report that during moderate physical exercise (walking for up to 4 hours), the migratory myoelectric complexes generating intestinal peristaltic waves are almost absent (Rao et al., 2004). In marathon runners, it was found that diarrheal syndrome and intestinal irritation are frequent, which suggests that physical exercise accelerates intestinal transit (Rao et al., 2004). Rao et al. tried to find a correlation between diarrheal

stools and intense physical exercise using telemetric pH measurements, with an enteral capsule. The results showed that in the majority of athletes, the duration of intestinal transit was the same in the group who performed physical exercise and the group at rest (Rao et al., 2004). An acceleration of intestinal transit may lead to deficient absorption of nutrients important for muscle contraction or may cause the accelerated passage of the small bowel content into the colon, along with biliary salts, leading to diarrhea (Kwon & Lamont, 2013; Rao et al., 2004).

The best way to prevent diarrhea induced by intense physical exercise is to avoid fat-rich foods, carbohydrates and hypercaloric foods several hours before training (Butcher, 1993). It is most frequently necessary to stop exercise and rehydrate because these symptoms may cause water electrolyte imbalance. If diarrheal symptoms are associated with nausea, vomiting or digestive hemorrhage, ischemic colitis or infectious gastrointestinal causes must be suspected (Kwon & Lamont, 2013; Rao et al., 2004).

Gastrointestinal hemorrhage

Digestive hemorrhage is the most important complication that occurs in athletes participating in endurance events. This is frequently occult, transient, and it rarely has a clinical or life threatening significance (Peters et al., 2001). Occult hemorrhage is associated with iron deficient anemia and the secondary impairment of the athlete's performance. Other causes of anemia might be dilution pseudoanemia, due to plasma expansion or mechanical intravascular hemolysis following repeated kicks or hand strikes in contact sports (Kwon & Lamont, 2013; Telford, 2003).

The incidence of occult digestive hemorrhage after a competition varies between 8-85% (Halvorsen, 1986). In a study performed on athletes participating in the ultramarathon, a race longer than 200 kilometers, it was found that 87% of the participants had digestive hemorrhage, demonstrated by positive stool tests for occult hemorrhage. The incidence of digestive hemorrhage increases proportionally to the distance run by marathon runners (Peters et al., 2001; Kwon & Lamont, 2013; Dimeo et al., 2004).

The etiology of digestive hemorrhage induced by physical exercise is not clear. It is suspected that mechanical intestinal trauma during running due to repeated impact along with mesenteric ischemia might cause gastrointestinal hemorrhage. The origin of hemorrhage could be found at any level of the gastrointestinal tract. In a study carried out in 16 long-distance runners, upper digestive endoscopy detected various degrees of gastritis, and four of the runners had a positive Hemoccult test (Sanchez et al., 2006). Another observation reports hemorrhagic gastropathy lesions, gastric ulcer, ischemic colitis and erosive gastritis evidenced by endoscopy in marathon runners (Kwon & Lamont, 2013). Thalmann et al. showed in a study on 37 athletes participating in the ultramarathon that prophylactic pantoprazole administration (20 mg) prevents the development of digestive hemorrhage (Thalmann et al., 2006).

Intestinal ischemia

Intestinal ischemia is rarely found in athletes, but when it manifests, it frequently affects the terminal ileon, the ascending colon and the sigmoid colon. The appearance of stools with pathological products, particularly blood, along with nausea, vomiting and abdominal pain at least 24 hours after an endurance competition raises the suspicion of ischemic colitis (Peters et al., 2001; Kwon & Lamont, 2013).

The main factor responsible for the development of intestinal ischemia is the decrease of blood flow in mesenteric circulation. During intense physical exercise, blood is mainly directed towards the limb muscles, which may cause a decrease of mesenteric flow by up to 80%. The amount of blood redirected from the intestinal area determines various degrees of gastrointestinal ischemic impairment, from cramps to ischemic colitis (Peters et al., 2001; Kwon & Lamont, 2013; Sanchez, et al., 2006). In a study monitoring splanchnic hemodynamics in marathon runners before and after competition, a significant decrease in the diameter of the upper mesenteric artery and a decrease in the resistivity index by Doppler ultrasound were found (Kwon & Lamont, 2013).

If an ischemic complication is suspected, adequate hydration both before and after competition is recommended, as well as the reduction/interruption of the intensity and duration of training (Peters et al., 2001).

Gastrointestinal infections

Such infections rapidly spread through the air or water among athletes participating in team sports or in big competitions with many athletes (Kwon & Lamont, 2013).

Haywood et al. demonstrated that probiotics help increase immunity. The study was carried out on a rugby team and included two groups: a group treated with probiotics and a group receiving placebo. In the group treated with probiotics, a significant decrease of complaints caused by respiratory and gastrointestinal infections compared to the placebo group was found. The results of this study are supported by other studies, which demonstrated a decrease in the incidence of infectious diseases in athletes using prophylactic probiotics (Haywood et al., 2014).

Discussion

Gastrointestinal complaints frequently occur during heavy training, particularly during competitions such as the marathon or the running event as part of the triathlon. Symptoms more frequently manifest in young, inexperienced competitors and in the female sex. The most frequent gastrointestinal complaints are gastroesophageal reflux, nausea, vomiting, diarrhea, abdominal pain and digestive hemorrage (Thalmann et al., 2006; Peters et al., 2001; Sanchez, et al., 2006; Halvorsen et al., 2014). Sullivan et al. noted a positive correlation between the intensity of physical exercise and the severity of gastrointestinal disorders. An increased prevalence of gastrointestinal complaints was evidenced in marathon runners who ran the race at a higher speed than the rest of the marathon runners (Halvorsen et al., 2014). There is a wide range of digestive disorders in athletes, in close relationship with the intensity and the duration of physical exercise.

For athletes complaining of gastroesophageal reflux disease symptoms such as pyrosis, abdominal pain, it is recommended to change diet, to avoid food consumption

at least two-three hours before training or competition, and when symptoms persist, pharmacological treatment with proton pump inhibitors has proved to have good results (Peters et al., 1999). For diarrheal syndrome, the avoidance of fat-rich, hypercaloric, hyperglucidic foods and adequate hydration are recommended (Kwon & Lamont, 2013; Rao et al., 2004). The most frequent form of presentation of digestive hemorrhage is occult hemorrhage, which is usually transient. Studies have demonstrated that prophylactic treatment with proton pump inhibitors has a very good effect for prevention (Thalmann et al., 2006). The treatment of digestive disorders in athletes is usually minimal, the most beneficial measures refer to diet that precedes physical exercise.

Some researchers estimate that the appearance of gastrointestinal symptoms might have a protective effect on abdominal organs, their progressive nature causing the athlete to reduce the intensity and duration of training (Peters et al., 2001).

Conclusions

1. Digestive disorders in athletes are numerous, most frequently transient, closely related to the intensity and duration of physical exercise.

2. Changes related to diet (content, relation of the meal to the time of performance of physical exercise) are most frequently sufficient; drug treatment is rarely required.

Conflicts of interest

Nothing to declare.

References

Butcher JD. Runner diarrhea and other intestinal problems of athletes. Am Fam Physician 1993; 48:623-627.

Clark CS, Kraus BB, Sinclair J, Castell DO. Gastroesophageal reflux induced by exercise in healthy volunteers. JAMA 1989;261:3599.

Collings KL, Pierce Pratt F, Rodriguez-Stanley S, et al. Esophageal reflux in conditioned runners, cyclists, and weightlifters. Med Sci Sports Exerc 2003;35:730.

Cordero A, Dolores M, Galve E. Physical Exercise and Health. Revista Espaniola de Cardiologia 2014;67(9):1-6.

Dimeo FC, Peters J, Guderian H. Abdominal pain in long distance runners: case report and analysis of the literature. Br J Sports Med 2004;38(5):E24.

Gil SM, Yazaki E, Evans DF. Aetiology of running - related gastrointestinal dysfunction. How far is the finishing line? Sports Med. 1998;26(6):365-378.

Halvorsen FA, Lyng J, Glomsaker T. Gastrointestinal disturbances in marathon runners. Br J Sp Med. 2014;24(4):266-268.

Halvorsen FA, Lyng J, Ritland S. Gastrointestinal bleeding in marathon runners. Scand J Gastroenterology 1986;21(4):493-497

Haywood AB, Black KE, Baker D et al. Probiotic supplementation reduces the duration and incidents of infections but not severity in elite rugby union players. J Sci Med Sport 2014;17(4):356-360.

Keeffe EB, Lowe DK, Goss JR, et al. Gastrointestinal symptoms of marathon runners. West J Med 1984;141:481-484

Kwon JH, Lamont T. Gastrointestinal disorders in athletes. Available online at: http://www.uptodate.com/contents/gastrointestinal-disorders-in-athletes. Accessed on 07/2013

Morton DP, Callister R. Characteristics and etiology of exercise - related transient abdominal pain. Med Sci Sports Exerc. 2000;32(2):432-438

Murray R. The effect of consuming carbohydrate - electrolyte bevereges on gastric emptying and fluid absortion during and following exercise. Sports Med 1987;4:322-351.

Parmelee KP, Moeller JL. Gastroesophageal reflux in athletes. Curr Sports Med Rep 2004;3:107-111

Peters HP, de Kort AF, van Krevelen, et al. The effect of omeprazol on gastro – esophageal reflux and symptoms during strenuous exercise. Aliment Pharmacol Ter 1999;13:1015-1022.

Peters HPF, De Vries WR, Vanberge-Henegouwen GP, Akkermans LM. Potential benefits and hazards of physical activity and exercise on the gastrointestinal tract. Gut, 2001;48:435-439.

Plunkett BT, Hopkins WG. Investigation of the side pain „stitch" induced by running after fluid ingestion. Med Sci Sports Exerc. 1999;31(8):1169-1175.

Rao AK, Yazaki E, Evans DF, et al. Objectiv evaluation of small bowel and colonic transit time using ph telemetry in athletes with gastrointestinal symptoms. Br J Sports Med 2004;38:482-487.

Sanchez LD, Corwell B, Berkoff D. Medical problems of marathon runners. Am J Emerg Med, 2006;24(5):608-615.

Sullivan SN. Exercise associated symptoms in traiathletes. Phys Sportmed 1987;15:105.

Telford RD, Sly GJ, Hahn AG, et al. Footstrike is the major cause of hemolysis during running. J Appl Physiol (1985) 2003;94(1):38-42

Thalmann M, Sodeck G, Kavouras S, et al. Proton pump inhibitor prevents gastrointestinal bleeding in ultramarathon runners: a randomised, double blind, placebo controlled study. Br J Sports Med. 2006;40(4):359-362.

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 250–254

Braces for conservative idiopathic scoliosis
Ortezele în tratamentul conservativ al scoliozelor idiopatice

László Irsay, Rodica Ungur, Monica Borda, Viorela Ciortea, Ioan Onac
Rehabilitation Department, "Iuliu Haţieganu" University of Medicine and Pharmacy, Cluj-Napoca
Clinical Rehabilitation Hospital Cluj-Napoca

Abstract

Idiopathic scoliosis is the most common form of deviation of the spine. Many articles suggest that these deviations have an unfavorable prognosis in adulthood if left untreated in childhood, altering the quality of life by causing back pain, compromising the pulmonary and heart functions, leading to psychosocial consequences and reducing life expectancy. Non-surgical methods are designed to stop the progression and ideally correct any existing axial deviation. The application of orthoses to this effect pre-dates the era of evidence-based medicine. Numerous studies have been conducted, but they use varied inclusion criteria and objectives, distinct braces and wearing periods and associations with other therapeutic methods. In light of all these factors, the results are often contradictory. The meta-analyses of the last five years have shown that orthotics is the most effective non-surgical therapeutic method and that evidence supports bracing over observation. The current concern is focused on the development of the most efficient type of orthoses and increased compliance.

Keywords: spinal orthoses, evidence, scoliosis.

Rezumat

Scolioza idiopatică este cea mai frecventă formă de deviaţie a coloanei. Multe articole sugerează că aceste devieri netratate la copil prezintă un prognostic nefavorabil la vârsta adultă, modificând calitatea vieţii prin dureri de spate, compromiterea funcţiei pulmonare, cardiace, consecinţe psihosociale şi scăderea duratei de viaţă. Metodele non-chirurgicale au rolul de a opri evoluţia spre progresie şi în mod ideal de a corecta deviaţia axială existentă. Aplicarea ortezelor cu acest scop pre-datează era medicinii bazate pe dovezi. Există numeroase studii, dar cu criterii de includere şi obiective foarte variate, orteze şi perioade de purtare diferite, precum şi asocierea cu alte mijloace terapeutice. Prin prisma acestora rezultatele obţinute sunt frecvent contradictorii. Metaanalizele din ultimele 5 ani au arătat că ortezarea reprezintă cea mai eficientă metodă terapeutică non-chirurgicală şi că evidenţele sunt în favoarea ortezării şi nu doar a urmăririi bolnavului. Preocuparea actuală se focusează asupra dezvoltării tipului de orteză cea mai eficientă şi creşterea complianţei.

Cuvinte cheie: orteze spinale, evidenţe, scolioze.

Introduction

Scoliosis is a three-dimensional spine deformity characterized by the lateral deviation of the vertebrae in the anterior plane (De Smet et al., 1984; Stokes et al., 1987).

The Scoliosis Research Society (SRS) defines idiopathic scoliosis in adolescents as a deviation that exceeds 11 degrees (***, 2000).

Smaller curvatures present a lower risk of progression (Rogala et al., 1978).

In approximately 20% of cases, scoliosis is secondary to a primary pathology, whereas in 80% of cases, it is idiopathic in nature. In general, 10% of these cases require conservative treatment and 0.1-0.3% of them require surgical treatment. Idiopathic scoliosis progression is more common in female adolescents. The male-female ratio is set at 1.3:1 for any Cobb angle between 10 and 20 degrees, 5.4:1 for any angle between 20 and 30 degrees and 7:1 for angles wider than 30 degrees (Negrini et al., 2012).

According to SRS reports, 2-3% of children under 16 years of age present a curvature of 10 degrees or less and only 0.3-0.5% present a curvature of 20 degrees or more. The scoliosis prevalence rate is considered to be 1-3% (Stokes & Luk, 2013).

Ponseti's classification consists of four major types of scoliosis: dorsal scoliosis, lumbar scoliosis, thoracolumbar scoliosis and S-shaped scoliosis. This is the traditional classification, still used for conservative treatment and pre-operative classification purposes (Ponseti & Friedman, 1950).

The primary objectives of the conservative treatment of idiopathic scoliosis can be divided into two groups: morphological objectives and functional ones. The former have an esthetic relevance, whereas the two together

Received: 2014, July 21; *Accepted for publication:* 2014, August 20;
Address for correspondence: "Iuliu Haţieganu" University of Medicine and Pharmacy, Clinical Rehabilitation Hospital, Rehabilitation Department, 46-50 Viilor st, 400437 Cluj-Napoca
E-mail: irsaylaszlo@gmail.com

determine the patient's quality of life and emotional well-being as well as prevent disability.

The objectives of the conservative treatment of idiopathic scoliosis include:

1. the cessation of the curve progression or its reduction;

2. the prevention or treatment of respiratory dysfunction;

3. the prevention or treatment of spinal pain syndromes;

4. the improvement of the aesthetics by correcting the posture.

Two highly effective correction methods set themselves apart from the conservative treatment methods. They are bracing and specific kinetotherapy. Other physiotherapy methods have proved their effectiveness in correcting the functional aspects, but cannot correct or stop the curve progression.

There is debate on the angles that require bracing, as well as on the corresponding types of spinal braces to be used. Specific kinetotherapy is recommended for all types of scoliosis and regardless of the deviation (Fusco et al., 2011; Negrini et al., 2008).

Spinal orthoses are external devices attached to the trunk with the purpose of stopping curve progression and correcting the deviation. Orthoses are made of fabrics and/or elastic bands. Evidence on their efficiency is clear (Negrini et al., 2012; Stokes et al., 2013).

The mechanism of action of orthoses is very complex: they promote neuro-motor reorganization through external and proprioceptive forces. On a biomechanical level, there are three manufacturing principles that must be met simultaneously:

1. *The pressure principle* - the pressure exerted by the brace on the trunk equals the sum of the forces acting on the surface. Therefore, the force acting at the level of the tegument will be indirectly proportional to the area of application.

2. *The equilibrium principle* - the sum of the resulting forces must be zero. In practice, the most frequently applied system is the 3-point pressure system, which occurs when a primary force is applied between two additional forces heading in opposite directions with the sum of all three forces equaling zero.

3. *The lever arm principle* - the distance from the point of application of the pressure force to the joint is directly proportional to the moment arm and indirectly proportional to the force necessary to generate a torsion force at the level of the joint. This principle justifies the use of metal or plastic bars in the manufacture of spinal orthoses. The torsion force increases proportionally to the bar length.

There is still ongoing debate on the recommended bracing time and duration as well as on the recommended brace angulation. According to the SRS, the best results are obtained in situations where the following criteria are met: the patient is at least 10 years of age at the time of bracing, the Risser sign is 0 to 2, the primary angle is 25 to 40 degrees and there is no prior treatment. Additionally, in the case of female patients, the orthotic treatment must be initiated in the premenarchal period or one year after the first menstrual period (Richards et al., 2005).

The opinions formulated by the authors are similar, but also refer to a number of other therapy methods. These indications can be found in the table below (Table I):

Table I

The authors' recommended treatment methods according to Risser sign and Cobb angle.

Risser sign	Cobb angle	Recommended methods
0 or 1	0-20	Observation, kinetotherapy
0 or 1	20 to 40	Corset, kinetotherapy
2 or 3	0 to 30	Observation, kinetotherapy
2 or 3	30 to 40	Corset, kinetotherapy
0 to 3	40 to 50	Corset, kinetotherapy, surgical treatment
0 to 4	≥ 50	Surgical treatment

Treatment guides do not recommend one type of spinal orthosis over another. They recommend the use of a rigid orthosis which has proved its effectiveness and has been used before.

Here are some details on the most common types of spinal orthoses, as well as some manufacturing principles and the obtained results:

1. *The Chêneau brace*

This brace was designed by Dr. Jacques Chêneau sometime around the 60's. The results from a first patient were registered in 1972 and officially presented in Bratislava in 1979. The Chêneau brace is a rigid brace with two main mechanisms of action:

a) *The passive mechanism*: convex to concave tissue transfer (the 3-point pressure system), elongation and unloading, derotation of the thorax, flexion;

b) *The active mechanism*: vertebral growth acting as a corrective factor, asymmetrically guided respiratory movements of the rib-cage, repositioning of the spatial arrangement of the trunk muscles, anti-gravitational effect (Kotwicki & Chêneau, 2008).

In 25% of cases, the treatment ended in a correction of the scoliosis, whereas in 23% of cases, it ended in its stabilization ($p<0.05$). The Chêneau brace is designed not only to stabilize and stop the scoliosis progression, but also to correct the curvature in some cases (Zaborowska-Sapeta et al., 2011).

There are also a number of braces based on the Chêneau brace (Bulthuis et al., 2008; De Mauroy et al., 2011; De Smet et al., 1984):

2. *The Rigo Chêneau brace*

This brace was developed by Rigo Manuel in the early 90's. It uses the concepts of equilibrium/disequilibrium at the point of transition and the counter-inclination at L4/L5 level. The Cobb angle correction of the main curvature is considered to be set at 53.7%. In patients with a single long dorsal curvature, the Cobb angle correction is set at 76.7%, 55.9% in axial rotation cases, respectively. This brace is recommended for patients presenting with mild to moderate juvenile scoliosis (Rigo et al., 2010; Rigo & Gallo, 2009).

3. *The Chêneau Light brace*

This brace was invented by Hans Rudolf Weiss in 2005. The advantage of this new bracing system is that the brace is available immediately and it can be both adjusted and modified very easily. The estimated Cobb angle correction is 16.4 degrees, with the value varying depending on

the anatomical level and the type of scoliosis (Weiss & Werkmann, 2010).

4. *The Gensingen brace*

Developed by the same team, this brace is a derivative of the Chêneau Light one. However, it uses the Computer Aided Design/Computer Aided Manufacturing technology. The Gensingen brace™ is used with curvature patterns a Chêneau light™ brace is not suitable for, as well as for curvatures exceeding 50 degrees (Weiss & Werkmann, 2010).

5. *The Lyonnaise (Lyon) brace*

Created by Pierre Stagna in 1947, this is an adjustable rigid brace with no neck ring. The treatment is based on two principles: an initial rigid cast is meant to stretch the deep ligaments before the application of the Lyon brace. This brace is mainly recommended for patients between 11 and 15 years of age. Its use in younger patients is not recommended for it can cause tubular deformations of the thorax. The Cobb angle correction is considered to be set at 12% in dorsal scoliosis cases and 10% in double scoliosis cases. A simultaneous corrective action on kyphosis has also been noticed (De Mauroy et al., 2011; Zaina et al., 2014).

6. *The Dynamic Derotating Brace (DDB)*

It was described as a modified Boston brace in Greece in 1982. It is recommended for the treatment of high apex curves, where the apex is at D5 level or further at cranial level (Grivas et al., 2010).

Published data indicate an average Cobb angle correction of 49.54% which can decrease to 44.1% after an observation period of 2 years (Zaina et al., 2014).

7. *The TriaC brace*

The TriaC brace was designed by Dr. Albert Gerrit Veldhuizen in the Netherlands. The name derives from the three C's – Comfort, Control and Cosmesis. The TriaC orthosis has a flexible coupling module which connects a thoracic part and a lumbar one. It exerts a transversal force, which consists of a progressive anterior force and a posterior one along with the associated rotation. There is no hip deviation in the sagittal plane, which allows flexibility without affecting the correction forces during movement (Veldhuizen et al., 2002).

An immediate correction of 22% for the primary curve and 35% for the secondary one can be noticed. The results remain unchanged even after a period of 1.6 years (Bulthuis et al., 2008).

8. *The Sforzesco brace*

This brace was developed by Stefano Negrini and his collaborators in Milan, Italy in 2004. It is based on the SPoRT concept - Symmetric, Patient-Oriented, Rigid, Three-Dimensional, Active. The Sforzesco brace combines characteristics of the Risser cast and the Lyon, Chêneau-Sibilla and Milwaukee braces. Its main action is to push the scoliosis upward from the pelvis, so as to deflex, derotate and restore the sagittal plane. Reported results show a level of effectiveness superior to that of the Lyon brace after a treatment period of 6 months (Negrini et al., 2006; Negrini & Marchini, 2007).

9. *The Progressive Action Short Brace (PASB)*

The Progressive Action Short Brace (PASB) has been used for the treatment of thoracolumbar and lumbar idiopathic curves. It is an original custom-made thoracolumbar-sacral orthosis (TLSO) designed by Dr. Lorenzo Aulisa in Italy. The device works based on the principle that a constrained spine dynamics can achieve correction of a curve by inverting the abnormal load distribution during growth. The forces exerted to correct the deformity include elongation, lateral flexion and derotation. In a transversal plane, these forces form an asymmetric ellipse. Overall, curve correction was achieved in up to 94% of patients, whereas curve stabilization was achieved in 6% of cases (Aulisa et al., 2009; Zaina et al., 2014).

10. *The Boston brace*

This brace is the most commonly used for the treatment of thoracolumbar scoliosis in North America. It was developed by John Hall and William Miller at Boston Children's Hospital in 1972. Miller and Hall tried to shorten the manufacturing process by developing a personalized mold model and six prefabricated models based on the cast device previously fitted for the Milwaukee braces. The manufacturing costs and time were reduced significantly. The Boston brace is symmetrical and features a posterior opening which incorporates the apex supports passively loading the curves. An opening is cut out in the thoracic support to allow the active transfer/exchange of the trunk and improve ventilation. Similarly to the Milwaukee brace, the Boston brace initially determined the correction of lumbar lordosis, which, in theory, allowed an improved correction of the pathological curve. Braces usually correct lumbar lordosis by 15 degrees with the purpose of lowering the risk of hypokyphosis. At the present moment, most braces are ordered following the body scan and CAD-CAM (Computer Aided Design/Computer Aided Manufacturing). Results: in 49% of cases, no curve modifications were registered; in 43% of cases, an improvement could be noticed; in 11% of cases, surgery was performed during that period of time with 1% of these patients undergoing surgery during the clinical observation period (Zaina et al., 2014; Emans, 1984).

11. *The Charleston brace*

Made by Frederick Reed and Ralph Hooper in Charleston, South Carolina in 1972, it was developed for patients who refused to wear a brace full-time. It is based on the principle derived from the Heuter-Vokmann one, where asymmetrical vertebral loading can affect bone growth. The orthosis is symmetrical and has an anterior opening as well as selective points of contact, allowing better correction than the other thoraco-lumbar-sacral orthoses. It is the best choice in cases of pathological lumbar, thoracic or thoracolumbar scoliosis. Studies have demonstrated that this orthosis can stabilize or improve scoliosis progression in 84% of cases (Lee et al., 2012).

12. *The Milwaukee brace*

Developed by Walter Blount and Albert Schmidt in Milwaukee, Wisconsin around 1945, it was initially used for the postoperative immobilization of neuro-muscular scoliosis. On account of the transformations in fashion trends and the psychological and emotional impact of wearing a large cervical thoracolumbar CTLSO, this brace has limited or overdue prescriptions. It is still used for the treatment of Scheuermann kyphosis and large pathological

thoracic curves. It is a symmetrical device with a posterior opening and enables curve correction through both passive and active mechanisms. Thoracic or axillary belts correct the curve passively and directly while the molds/supports at neck level or the lateral ones correct it actively. This active method of muscle correction has proved ineffective in scoliosis patients, but effective in kyphosis ones. Initially, the support/corset was made of leather, but the material was then replaced with thermoplastic ones resistant to high and low temperatures and easier and cheaper to process (cost-benefit ratio). According to Lonstein and Winter, 22% of a group of 1,020 patients whose treatment included these braces underwent surgery, this rate being higher in the case of patients with curvatures exceeding 30 degrees and a Risser sign of 0 or 1. The main problems with this type of orthosis lie in its compliance and low acceptability, the two justifying its limited use at night (Zaina et al., 2014; Lonstein & Winter, 1994; Maruyama et al., 2008).

Other braces are mainly used in North America, but the results of studies are inconstant or unclear. These braces include the Providence brace, the SpineCor brace and the Wilmington brace (Zaina et al., 2014).

The efficiency and monitoring of bracing in scoliosis patients

Evidence on bracing and kinetotherapy for conservative scoliosis treatment is clear. Randomized prospective studies, inclusion and efficiency criteria and monitoring methods raise various difficulties in conducting studies. There is insufficient data to perform a comparison between braces. The SRS recommends the use of that brace that has delivered the best results. Current data does not recommend the use of flexible braces made exclusively of fabrics for the treatment of scoliosis (Zaina et al., 2014).

Compliance to the orthotic treatment is usually low. It has been noticed that there is an almost linear connection between the therapeutic success of a brace and the amount of time it is worn for over a period of 24 hours. The best results were associated with patients who wore the brace for over 17.6 hours out of 24 (Weinstein et al., 2013).

The wearing period can be monitored by recording the infrared radiation using a sensor installed directly on the corset. This temperature sensor records the temperature values close to the patient's body temperature. Whenever these values are lower, it does not record anything. The recorded data is then downloaded using a software reader (Zaina et al., 2014).

Conclusions

1. Braces reduce the need for surgery as well as the aesthetic impact of the deformity in patients suffering from idiopathic scoliosis.

2. There are studies revealing the efficiency of braces in stopping curve progression and correcting deviations.

3. Bracing is only used for scoliosis treatment in cases where the curvature exceeds 15±5 degrees or progressive factors can be identified.

4. It is recommended that the scoliosis treatment uses the corset the team is most experienced with.

5. The brace should be worn for a minimum 17-18 hours daily. It has been noticed that there is an almost linear connection between the therapeutic success of a brace and the wearing period.

6. Orthotic treatment is recommended until skeletal maturity or cessation of the curve progression is achieved. Individual experience is also relevant.

7. The wearing period is to be reduced gradually.

8. The efficiency of the corset is monitored objectively through instant infrared imaging.

9. The bracing method does not replace specific kinetotherapy. It complements it. Kinetotherapy programs may or may not include bracing.

Conflicts of interest

Nothing to declare.

References

Aulisa AG, Guzzanti V, Galli M, Perisano C, Falciglia F, Aulisa L. Treatment of thoraco-lumbar curves in adolescent females affected by idiopathic scoliosis with a progressive action short brace (PASB): assessment of results according to the SRS committee on bracing and nonoperative management standardization criteria. Scoliosis. 2009;4:21.

Bulthuis GJ, Veldhuizen AG, Z Nijenbanning G. Clinical effect of continuous corrective force delivery in the non-operative treatment of idiopathic scoliosis: a prospective cohort study of the triac-brace Eur Spine J. 2008;17:231-239.

De Mauroy JC, Lecante C, Barral F. „Brace Technology" Thematic Series - The Lyon approach to the conservative treatment of scoliosis. Scoliosis. 2011;6:4.

De Smet AA, Asher MA, Cook LT et al. Three-dimensional analysis of right thoracic idiopathic scoliosis. Spine (Phila Pa 1976) 1984;9:377-381.

Emans JB. Scoliosis: diagnosis and current treatment. Women Health. 1984;9(2-3):81-102.

Fusco C, Zaina F, Atanasio S, Romano M, Negrini A, Negrini S. Physical exercises in the treatment of adolescent idiopathic scoliosis: an updated systematic review. Physiother Theory Pract. 2011;27(1):80-114.

Grivas TB, Bountis A, Vrasami A, Bardakos NV. Brace technology thematic series: the dynamic derotation brace. Scoliosis 2010,5:20.

Kotwicki T, Chêneau J. Biomechanical action of a corrective brace on thoracic idiopathic scoliosis: Chêneau 2000 orthosis. Disabil Rehabil Assist Technol. 2008;3(3):146-153.

Lee CS, Hwang CJ, Kim DJ, Kim JH, Kim YT, Lee MY, Yoon SJ, Lee DH. Effectiveness of the Charleston night-time bending brace in the treatment of adolescent idiopathic scoliosis. J Pediatr Orthop. 2012;32(4):368-372.

Lonstein JE, Winter RB. The Milwaukee brace for the treatment of adolescent idiopathic scoliosis. A review of one thousand and twenty patients. J Bone Joint Surg Am. 1994;76(8):1207-1221.

Maruyama T, Takeshita K, Kitagawa T. Milwaukee brace today. Disabil Rehabil Assist Technol. 2008;3(3):136-138.

Negrini S, Aulisa AG, Aulisa L, Circo AB, de Mauroy JC, Durmala J, Grivas TB, Knott P, Kotwicki T, Maruyama T, Minozzi S, O'Brien JP, Papadopoulos D, Rigo M, Rivard CH, Romano M, Wynne JH, Villagrasa M, Weiss HR, Zaina F. 2011 SOSORT guidelines: Orthopaedic and Rehabilitation treatment of idiopathic scoliosis during growth. Scoliosis. 2012 Jan 20;7(1):3.

Negrini S, Fusco C, Minozzi S, Atanasio S, Zaina F, Romano M.

Exercises reduce the progression rate of adolescent idiopathic scoliosis: results of a comprehensive systematicreview of the literature. Disabil Rehabil. 2008;30(10):772-785.

Negrini S, Marchini G, Tomaello L. The Sforzesco brace and SPoRT concept (Symmetric, Patient-oriented, Rigid, Three-dimensional) versus the Lyon brace and 3-point systems for bracing idiopathic scoliosis. Stud Health Technol Inform. 2006;123:245-249.

Negrini S, Marchini G. Efficacy of the symmetric, patient-oriented, rigid, three-dimensional, active (SPoRT) concept of bracing for scoliosis: a prospective study of the Sforzesco versus Lyon brace. Eura Medicophys. 2007;43(2):171-181.

Ponseti IV, Friedman B: Prognosis in idiopathic scoliosis. J Bone Joint Surg Am 1950, 32A(2):381-395.

Richards BS, Bernstein RM, D'Amato CR, Thompson GH. Standardization of criteria for adolescent idiopathic scoliosis brace studies: SRS Committee on Bracing and Nonoperative Management. Spine 2005;30(18):2068-2075.

Rigo DM, Gallo D, Dallmayer R. In-brace correction of the Cobb angle with RSC-CAD CAM compared with ‚hand made' from the original author. Scoliosis. 2010;5(Suppl 1): O68.

Rigo M, Gallo D. A new RSC brace design to treat single long thoracic scoliosis. Comparison of the in-brace correction in two groups treated with the new and the classical models. Scoliosis. 2009; 4(Suppl 2): O46.

Rogala EJ, Drummond DS, Gurr J. Scoliosis: incidence and natural history: a prospective epidemiological study. J Bone Joint Surg [Am] 1978;60(2):173–176.

Stokes IA, Bigalow LC, Moreland MS. Three-dimensional spinal curvature in idiopathic scoliosis. J Orthop Res 1987;5:102-113.

Stokes OM, Luk KD. The current status of bracing for patients with adolescent idiopathic scoliosis. Bone Joint J. 2013;95-B(10):1308-1316.

Veldhuizen AG, Cheung J, Bulthuis GJ, Nijenbanning G. A new orthotic device in the nonoperative treatment of idiopathic scoliosis. Med Engineering & Physics, 2002:24, 209-218.

Weinstein SL, Dolan LA, Wright JG, Dobbs MB. Effects of bracing in adolescents with idiopathic scoliosis. N Engl J Med. 2013;369(16):1512-1521.

Weiss HR, Werkmann M. „Brace Technology" Thematic Series - The ScoliOlogiC® Chêneau light™ brace in the treatment of scoliosis. Scoliosis. 2010;5:19.

Zaborowska-Sapeta K, Kowalski IM, Kotwicki T, Protasiewicz-Fałdowska H, Kiebzak W. Effectiveness of Chêneau brace treatment for idiopathic scoliosis: prospective study in 79 patients followed to skeletal maturity. Scoliosis. 2011;6(1):2.

Zaina F, De Mauroy JC, Grivas T, Hresko MT, Kotwizki T, Maruyama T, Price N, Rigo M, Stikeleather L, Wynne J, Negrini S. Bracing for scoliosis in 2014: state of the art. Eur J Phys Rehabil Med. 2014;50(1):93-110.

***. SRS Terminology Committee and Working Group on Spinal Classification Revised Glossary of Terms. USA, 2000. Available online at: http://www.srs.org/professionals/glossary/SRS_revised_glossary_of_terms.htm Accessed on 16 July 2014.

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 255–258

Senescence – a determinant or contributory cause of increasing the risk of falling? (Note I)
Senescenţa - factor determinant sau cauză favorizantă pentru creşterea riscului de cădere? (Nota I)

Dana-Maria Dimulescu, Gheorghe Chiriţi
Carol Davila" University of Medicine and Pharmacy, Bucharest
National Institute of Rehabilitation, Physical Medicine and Balneoclimatology

Abstract

Aproximately one third of elderly persons over the age of 65 who live in the community fall each year; 3-5% of falls result in a fracture and 5 to 10% of them result in other serious injuries requiring medical care. Intrinsic risk factors for fall include: advanced age, female sex, impaired balance, gait abnormalities, reduced muscular strength, cognitive deficiencies, impaired visual acuity and use of sedative-hypnotic medications.

For a standardized locomotor assessment, the following are used: self-selected gait velocity, the chair rise test, tandem standing and tandem walking, the timed up and go test, clinical gait analysis with special focus on regularity. Gait analysis is an indicator of mobility, balance and fall risk in balance-impaired older adults. The relationship between two tests of stepping ability was determined: the maximal step length (MSL) and the rapid step test (RST); MSL score was associated with the risk of being a frequent faller. The following factors are crucial for recurrent falls among the elderly: abnormal posture balance, 2 or more falls recorded the previous year, a drop in the score of hand grip strength, the presence of a depressive state.

Keywords: senescence, fall risk, gait abnormalities.

Rezumat

La 1/3 dintre vârstnicii de peste 65 ani ce trăiesc în comunitate sunt raportate căderi, din care 3-5% se soldează cu fracturi, 5-10% determină leziuni serioase ce solicită echipa medicală. Factorii de risc intrinseci pentru căderi au inclus: vârsta avansată, genul feminin, tulburările de echilibru (balans), tulburările de mers, scăderea forţei musculare, deficitul cognitiv, scăderea acuităţii vizuale şi folosirea de medicamente sedative sau hipnotice.

Pentru evaluarea locomotorie standard se utilizează: viteza de mers autoselectată; testul ridicării de pe scaun; dublul sprijin în ortostatism şi mers; testul „ridică-te şi mergi"; analiza clinică a mersului, ţintită pe simetria mersului. Testarea mersului este un indicator al mobilităţii, balansului şi riscului de cădere în disfuncţia echilibrului la vârstnici. S-a determinat relaţia între 2 teste de abilitate a mersului: MSL (lungimea maximă a pasului) şi RST (testul mersului rapid); scorul MSL se asociază cu riscul de căderi frecvente.

Factorii determinanţi pentru căderile recurente la vârstnici sunt: balansul postural anormal, 2 sau mai multe căderi în anul precedent, scăderea scorului pentru forţa de prindere a mâinii, prezenţa unei stări depresive.

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

Introduction

Aging is a process that turns a vigorous adult into a frail individual, with limited resources in most bodily tracts and systems; at the same time, there is an exponential increase of susceptibility to most diseases. The influence of aging on the general state of health and on the quality of life goes beyond the effects of any known illness, age itself being the main risk factor for contracting most of the existing serious diseases. During the aging process, physiological functions undergo many deteriorative changes. Senescence analyzes these deteriorative changes incurred over time, during the post-maturity stage, that lead to an increased vulnerability and a lower survival capacity (Prada, 2001).

Senescence and the risk of falling

Some studies show that about one third of the elderly people above the age of 65 living in the community fall every year and 3-5% of these falls lead to fractures, while 5-10% lead to serious injuries that require the intervention of a medical team. Even without serious bodily injuries, the falls can have important psychological consequences that will accelerate the functioning capacity decay (Dargent-Molina & Breart, 1995).

In reality, the frequency of falling is actually higher than the one officially reported because old people sometimes hide these events, out of pride or fear. Some random epidemiological investigations conducted among elderly people over the age of 65 show that between 30 and 50%

Received: 2014, July 24; *Accepted for publication:* 2014, August 30;
Address for correspondence: "Carol Davila" University of Medicine and Pharmacy, Bucharest, Faculty of Medicine, Eroilor Sanitari Av. no.8
E-mail: dm.dimulescu@gmail.com

of the community and institutionalized elderly population fall at least once a year. 20% of these incidents require the intervention of a medical team and 10% lead to fractures. Other surveys show that 20% of the falls recorded among the elderly population cause serious trauma (62% fractures, 25% sprains, 8% deep soft tissue wounds). An epidemiological survey conducted on institutionalized old persons shows that these subjects fall three times more frequently than the elderly people living at home. These investigations also reveal a high recurrence rate, about 50% of the elderly population falling repeatedly. The psychological consequences of falling are also mentioned, as they compromise the independence of the elderly person in question (Avorn, 1998).

These surveys report various levels of falling frequency and prevalence among different elderly groups:

- 33% of the healthy elderly population living in the community fall each year.

- 67% per year is the falling frequency among home-assisted elderly people, although they have limited activities and they are protected against inherent risk factors.

There are no surveys conducted on the falling frequency among hospitalized elderly people. However, it is known that this rate is higher than the one recorded among elderly living in the community, a fact that might be explained by the increased frailty of hospitalized patients.

Falling is the main cause of death among the population over the age of 65 and the 7th cause of death among the elderly, in general. In the USA, 75% of the deaths caused by falling are recorded among the over 65s, although the over 65s account for merely 2% of the entire population of the country. The rate of deaths caused by falling increases exponentially after the age of 75, in both genders. Before the age of 75, these deaths are more frequently encountered among women. After 75 years, the frequency is the same in both genders, while the highest rate of deaths caused by falling is recorded after the age of 85. (Cartier, 2001).

The frequency of falling increases with age: 35% of those aged between 65-79, 45% of those aged between 80-89 and 55% of those aged 90 and over fall at least once each year.

The information recorded by European Institutions (The European Home and Leisure Accident Surveillance System – EHLASS) leads to similar conclusions on this matter. The age-fall relation is not linear (Campbell, 1997); this relationship can only be seen in cases of recurrent falls, without being visible in the case of singular falls. These singular falls tend to affect women more frequently than they affect the men of the same generation. However, when it comes to recurrent falls, the frequency is approximately the same among both genders (Gostynski, 1999).

Some epidemiological surveys have identified the main risk factors increasing the number of falls. They comprise: old age, female gender, balance disorders, walking disorders, decrease in muscle strength, mental impairment, loss of visual sharpness and the use of sedatives and hypnotic medications.

Some recent epidemiological surveys compare the falls leading to serious bodily injuries to those with no such consequences, suggesting that an appropriate bone structure, an appropriate speed and good protective reflexes have a great impact on the risk of trauma after a fall (Dargent-Molina & Breart, 1995).

Non-syncopal falls, occurring during normal daily activities conducted by the elderly people, can have serious consequences, such as: hip fractures, shoulder fractures, hand fractures or pelvis fractures. The fear of falling and the self-imposed limitation of physical activities can lead to psychological disorders. A pathological link is born between age-related walking disorders and balance disorders leading to falls and bearing consequences, through the occurrence of fractures, on the neuro-myo-arthro-kinetic system (NMAK). The significant increase in the risk of falling, due to walking and balance disorders, can be considered as a distinct chronic pathological illness (defined as "age-related walking disorder").

The risk of fracture requires the assessment of falling risk, the assessment of the falling mechanism and that of bone resistance. Elderly people with walking and balance impairment usually fall on the diagonal, while the impact of each fall on the general balance generates enough force to fracture the non-osteoporotic thigh bone of the subject. Osteoporosis can decrease bone resistance even more, thus becoming the main risk factor for fractures and going beyond the normal age-driven changes.

Some prospective surveys have independently tracked the risk factors for non-syncopal falls among the elderly: the muscle strength of the legs; lateral postural stability; the clinical assessment of gait; visual impairment; four or more various psychotropic medications; cognitive impairment; falling history. The neuromuscular status can be appropriately assessed after a fall by 3 diagnostic procedures: 1) the chair-rise test assesses muscle strength, being relevant both for the falling risk and for the mobility and the functional independence impairment; 2) the measurement of lateral postural stability can be added to this procedure; 3) the clinical assessment of gait should be focused on the regular aspect of walking, as a clinical process. For an individual, the level of falling risk depends, to a great extent, on the number of independent risk factors that have accumulated (prevention and therapy should be focused on each of these individual risk factors) (Runge, 2002).

The neuromuscular parameters of locomotion and the risk of falling among elderly people

The neuromuscular parameters defining locomotion are necessary for discovering and treating frailty, fracture risks and osteoporosis. A standard locomotion assessment conducted scientifically is an essential part of medical examination, both in clinical practice and in research. This should comprise parameters predicting both a future fracture and an imminent destabilisation. The following tests have been put forward for a standard locomotion assessment. 1) The self-selected speed of walking, seen as the best way to assess the general locomotor status and as a good indicator of age-triggered adverse reactions. 2) The chair-rise test measures the vertical movement strength and the hip muscle strength as the most important neuromuscular factor for falling and for fractures caused by falling. Tandem standing and walking measure the posture balance capacity. 3) The timed "up and go" test is a global screening procedure. 4) The clinical gait analysis, focusing on the symmetry of gait. Mechanical means are used, at research level, to record the ground

reaction forces during walking, the linear movement speed on the pressure point, the strength used during the free physiological movements. In the mechanical means used for this purpose, the eccentric and the concentric stages of movement can differ and energy accumulation within the elastic tissues can be analyzed; the kinetics of human movement can be explained mechanically, through a two feet jump: the ground reaction forces resulting from a jump under the height of 0.46 m prove that this performance is representative for coordination (Runge & Hunter, 2006).

Gait analysis is a mobility and balance indicator, as well as an indicator for the falling risk among the balance-impaired elderly population. A connection has been established between two tests of stepping ability: MSL (maximal step length) and RST (the rapid step test) and the standard balance, mobility, walking and impairment tests among the group of elderly people with a high falling risk.

A number of 167 old people with medium level balance impairment (and an average age of 78 years) were examined. The following were measured: MSL (maximal step length) and the return to the initial position as well as the walking pace (RST - the minimum time needed for the steps to be taken and for a turn towards a different direction as fast as possible), tandem walk (TW), timed unipedal stance (US), timed up and go (TUG), performance oriented mobility assessment (POMA), the 6 minutes walking test (SMW), measuring the step length (the peak knee and ankle torque and power at slow and fast speeds); self-reported measurements compared to those of frequent fallers (who suffer more than two falls per year); the Established Population for Epidemiologic Studies of the Elderly (EPESE) physical function and confidence to avoid falls - Activity specific Balance Confidence (ABC Scale). MSL is an indicator predicting the number of self-reported falls and the measurement performance; it is correlated with EPESE (physical function impairment), with ABC, TUG, with the POMA score, the SMW test. The peak of the maximum knee and ankle torque and the force should be correlated with TS, TW, US. The MSL score is associated with the risk of frequent falling (6 MSL directions were highly correlated - up to 0.96 - with the risk of falling) (Cho et al., 2004).

A study was performed on the indicators of occasional or recurrent falls among the elderly: it included 622 people aged over 65 years, 107 of which (17.2%) reported occasional falls (at least once). Other 36 (5.5%) reported 2 or more falls (recurring) during the last 6 months. The predictors for all falls were: age, female gender, lack of family, poor health state, memory impairment, depression, sleeping disorders, incontinence, vertigo, 3 or more diseases found, physical impairment and low mobility (Gassmann et al., 2009).

The disturbance time and the walking speed influence the falling direction and the impact location: the falling direction and the impact of the fall on the pelvis were studied in four different cases – fainting, slipping, walking downhill and marching, for three different speeds (fast, normal, slow). The falling direction and the falling impact on the pelvis were measured. In the case of falling and slipping at slow speed, the impact on the hip was detected. Marching or walking downhill at slow speed led to forward falls, with an exaggerated frontal impact; usual slips and fainting at high speed led to forward falls, with a frontal impact. Usual slips at slow speed led to diagonal or back falls, with an impact on the hip's joint area. Fainting and slipping at slow speed resulted in hip impacts, increasing the risk of hip fracture; 56% of the impact velocity followed a standard deviation seen as an average velocity needed for hip fractures to occur in elderly people (Smeesters et al., 2001).

The falls were simulated using the ATB (articulated total body) and creating a model for passive falls; the predictions regarding the fall direction, the velocity impact, the functional impact in various perturbing circumstances (fainting, slipping, walking downhill, marching) were compared for various walking speeds - fast, normal, slow. ATB is a three-dimensional model with 17 segments and 16 joints. For each perturbing combination and walking speed, the ATB model for passive falls under the influence of gravity was applied up to the floor impact. The model thus predicts the falling and the impact angle (Smeesters et al. 2007).

This model is a step forward in the field of simulated falls; it can be used for a better understanding of the etiology and the mechanism of a fall, in relation to hip fractures.

A percent of 90% of the hip fractures recorded among the elderly are caused by falls. The hip fracture risk is higher in the case of a diagonal fall and, most of all, in the case of direct hip impact. Direct hip impact can be avoided during a diagonal fall, by rotating forwards, arms fully stretched. Another option is rotating backwards and landing on the buttocks. During a diagonal fall, the risk of hip impact and hip fracture can be decreased either through a forward or through a backward rotation, depending on the individual factors. For the backward rotation with landing on the buttocks, some studies revealed a higher velocity impact on the pelvis and a huge kinetic impact energy on the entire body (Robinovitch et al., 2003).

Factors increasing the risk of elderly people falling while at home. A risk model for falling

The method of assessing walking outside a lab identifies the risk factors for the elderly to fall while at home. The parameters used were: length of the step, walking speed, walking initiation, ability to turn the head while walking, static balance. The following were discovered in the case of the elderly group: slow walking speed (≤ 0.5 m/s), small steps, difficulties in turning the head while walking and balance disorder - significantly associated with unstable walking ($p \leq 0.01$). These parameters were significantly associated with the frequency of self-reported falls among single women. Slow speed walking was associated with symptoms of depression (detected through screening tests - the Geriatric Depression Scale) and with a poor health condition. 58% of those living alone were found to be exposed to one or more risk factors (Fried et al, 1990).

The predictive value of risk factors for recurrent falls was analyzed, a risk model being thus created, in order to facilitate the assessment of elderly mobility and that of elderly risk for recurrent falls.

The following aspects have been taken into consideration in 311 studies: previous falls, age, gender. Those aged over 70 were asked to answer a series of questions regarding several important aspects, including: physical and mental assessment, balance, walking, muscle strength. Previous falls and injuries caused by them were

assessed. 33% of the participants reported a total of 197 falls. 1 fall for 17%, 2 or more falls for 16%. 45% of those who reported falls also reported after-fall injuries: 2% hip fractures, 4% other fractures, 39% minor injuries. According to the fall risk model predicting the risk of recurrent falls based on logistic regressive analysis, the following elements are deemed decisive for the occurrence of recurrent falls: abnormal posture balance, 2 or more falls recorded in the previous year, a drop in the score of hand grip strength, the presence of a depressive state. There are three risk categories: low risk (0-1 predictor), moderate risk (2 predictors) and high risk (more than 3 predictors). In conclusion, the impairment of posture balance, a falling history, the decrease of hand grip strength (assessed with a dynamometer) and the presence of depression facilitate the prediction of recurrent falls (Stalenhoef et al, 2002).

Recurrent falls were analyzed in 30 elderly people (average age: 84.4 years) in relation to the double task situation (the simultaneous association of posture and cognition). The occurrence of falls for the following year was calculated (by collecting monthly data); the participants were split in 3 groups, based on the frequency of falling (0, 1, ≥2). The recurrent falls were defined as 2 or 3 falls during the last 12 months; 9.4% of the subjects reported recurrent falls. The frequency and the recurrence of these falls were associated with: age, number of medications taken and the walking speed (for usual walking and backwards walking). Only the walking speed and the double task situation were associated with the incidence of falling. A slow walking speed and backwards walking were associated with recurrent falls, suggesting that changing the walking performance during a double task situation might be a convenient way to identify the frailty of falling-prone elderly people (Beauchet et al, 2008).

Walking changes during a double task situation were associated with an increased falling risk among the elderly and a higher frailty of the same. The relation between the inherent falling risk factors and the walking changes associated with a double task situation increases elderly frailty. The walking time and the number of steps taken during usual and backwards walking were measured in 83 year-old men and 84 year-old women. The relation between walking changes, associated with a double task situation (walking time and number of steps), and age over 85, poly-medication, psychotropic substances, visual impairment, abnormal mobility, cognitive impairment was explored through a multiple regressive linear analysis. From a strictly walking point of view, both the walking time and the number of steps increased significantly during backwards walking. Poly-medication and abnormal mobility were associated with a significant increase in the walking time and in the number of steps taken; the walking changes associated with a double task situation were correlated with poly-medication and mobility impairment, indicating a higher transition frailty among the elderly (Beauchet et al., 2005).

Conclusions

1. Gait analysis as a mobility, balance and falling risk indicator among balance impaired elderly people requires two tests of stepping ability: MSL (maximal step length) and RTS (the rapid step test). The MSL score is associated with the risk of frequent falling.

2. 90% of the hip fractures recorded among the elderly population are caused by diagonal falls. Their hip impact can be prevented by forward rotation during the fall, arms stretched, or by backward rotation and landing on the buttocks.

3. The following factors are crucial for recurrent falls among the elderly: abnormal posture balance, 2 or more falls recorded the previous year, a drop in the score of hand grip strength, the presence of a depressive state.

Conflicts of interest

Nothing to declare.

References

Avorn J. Depression in the elderly-Falls and pitfalls. N.Engl J.Med. 1998;339(13):918-920.

Beauchet O, Annweiler C, Allali G, Berrut G, Herrmann FR, Dubost V. Recurrent falls and dual task-related decrease in walking speed: is there a relationship? J. Am. Geriatr. Soc, 2008;56(7):1265-1269.

Beauchet O, Dubost V, Herrmann F, Rabilloud M, Gonthier R, Kressig RW. Relationship between dual-task related gait changes and intrinsic risk factors for falls among transitional frail older adults. Aging Clin. Exp. Res., 2005;17(4);270-275.

Campbell AJ. Randomised controlled trial of a general practice programme of home based exercise to prevent falls in elderly women. B.M.J. 1997;315:1065-1069.

Cartier L. Falls and gait alterations in elderly, Rev. Med. Chi, 2002;130(3):332-337.

Cho BL, Scarpace D, Alexander NB. Tests of stepping as indicators of mobility, balance, and fall risk in balance-impaired older adults. J. Am. Geriatr. Soc., 2004;52(7):1168-1173.

Dargent-Molina P, Breart G. Epidemiology of falls and fall-related injuries in the aged. Epidemiol. Sante Publique, 1995;43(1):72-83.

Fried AV, Cwikel J, Ring H, Galinsky D. ELGAM-extra-laboratory gait assessment method: identification of risk factors for falls among the elderly at home. Int. Disabil. Stud., 1990;12(4):161-164.

Gassmann KG, Rupprecht R, Freiberger E, Izg Study Group. Predictors for occasional and recurrent falls in community-dwelling older people. Z. Gerontol. Geriatr., 2009;42(1):3-10.

Gostynski M. Epidemiological analysis of accidental falls by the elderly in Zurich and Geneva. Schweiz Med.Wochenschr, 1999;129(7):270-275.

Prada GI. Geriatrie şi gerontologie. Note de curs. Vol. I. Ed. Medicală Bucureşti, 2001.

Robinovitch SN, Inkster L, Maurer J, Warnick B. Strategies for avoiding hip impact during sideways falls. J. Bone Miner. Res., 2003;18(7):1267-1273.

Runge M, Hunter G. Determinants of musculoskeletal frailty and the risk of falls in old age. J. Musculoskelet. Interact., 2006;6(2):167-173.

Runge M. Diagnosis of the risk of accidental falls in the elderly. Ther. Umsch, 2002;59(7):351-358.

Smeesters C, Hayes WC, McMahon TA. Determining fall direction and impact location for various disturbances and gait speeds using the articulated total body model. J. Biomech. Eng., 2007;129(3):393-399.

Smeesters C, Hayes WC, McMahon TA. Disturbance type and gait speed affect fall direction and impact location. J. Biomech, 2001;34(3):309-317.

Stalenhoef PA, Diederiks JP, Knottnerus JA, Kester AD, Crebolder HF. A risk model for the prediction of recurrent falls in community-dwelling elderly: a prespective cohort study. J. Clin. Epidemiol., 2002;55(11):1088-1094.

Palestrica Mileniului III – Civilizaţie şi Sport
Vol. 15, no. 3, Iulie-Septembrie 2014, 259–262

Consideraţii despre Gheorghe Moceanu şi o carte uitată, alcătuită de el

Considerations about Gheorghe Moceanu and a forgotten book, elaborated by him

Cristian Bârsu
Disciplina Ştiinţe Socio-Umaniste şi Istoria Medicinii, Universitatea de Medicină şi Farmacie „Iuliu Haţieganu" Cluj-Napoca

Rezumat

Gheorghe Moceanu (1835-1909) a fost primul profesor de gimnastică, scrimă şi dansuri populare din România.

Lucrarea noastră se doreşte a fi un omagiu al personalităţii sale la împlinirea a 105 ani de la încetarea sa din viaţă. Pe lângă câteva date importante din biografia şi realizările sale în domeniul educaţiei fizice, sunt expuse aprecierile unor contemporani ai săi: Nicolae Iorga, Cella Delavrancea şi Onoriu Cheţianu.

Un alt scop al lucrării noastre este prezentarea unei cărţi rare, alcătuită de Moceanu şi intitulată „Istoria, anatomia şi higiena gimnasticii, după cei mai însemnaţi autori, cu figurile principale şi textul explicator al băilor şi şcolii de înotat". Aceasta a avut câteva ediţii, cea de-a patra fiind publicată în 1881, la Bucureşti. Moceanu a menţionat în introducere faptul că a alcătuit volumul prin traducerea capitolelor de istoria, anatomia şi igiena gimnasticii dintr-o carte scrisă de Junot şi Senglet, la care au fost adăugate câteva figuri şi explicaţii dintr-un studiu de Moritz Kloss despre băile şi şcoala de înot.

Cuvinte cheie: Gheorghe Moceanu, gimnastică, înot, anatomie, fiziologie, igienă.

Abstract

Gheorghe Moceanu (1835-1909) was the first teacher of gymnastics, fencing and peasants' dances from Romania.

Our paper is intended to be an homage to his memory, at the fulfillment of 105 years since he died. Besides some important date about his biography and achievements in the field of physical education, there are presented the appreciations of some of his contemporaries: Nicolae Iorga, Cella Delavrancea and Onoriu Cheţianu.

Another aim of our paper is to present a rare book, elaborated by him and entitled "The History, Anatomy and Hygiene of Gymnastics, Following the Most Significant Authors, with the Principal Figures and Explanations about Bathes and School of Swimming". The book was published several times, the forth one being published in 1881, in Bucharest. Moceanu mentioned in the introduction on this book that he elaborated it translating the chapters about the history, anatomy, physiology and hygiene of gymnastics from a book written by Junot and Senglet, adding some figures and explanations from a study of Moritz Kloss about bathes and swimming school.

Keywords: Gheorghe Moceanu, gymnastics, swimming, anatomy, physiology, hygiene.

Introducere

Gheorghe Moceanu (1835-1909) a fost o personalitate a gimnasticii din a doua jumătate a secolului al XIX-lea. Este nedrept faptul că celebritatea pe care a dobândit-o printr-o amplă şi valoroasă activitate profesională s-a estompat apoi progresiv, după încetarea sa din viaţă. În acest sens, după numai trei decenii de la decesul său medicul sportiv şi profesorul Onoriu Cheţianu (1906-1979) constata cu tristeţe faptul că Moceanu era deja considerat unul dintre „dascălii ardeleni" care „s-a strecurat în lumea uitării" (Cheţianu, 1939). În prezent sunt făcute diferite demersuri pentru ca aportul său în educaţia fizică din România să fie cunoscut şi apreciat la justa sa valoare. În acest sens prezentăm câteva consideraţii despre realizările sale profesionale, cu ocazia împlinirii a 105 ani de la moartea sa, precum şi o carte uitată pe care Moceanu a elaborat-o despre istoria, anatomia şi igiena gimnasticii, cu noţiuni despre şcoala de înot.

Date importante despre cariera lui Moceanu

S-a născut în 1835, în comuna Orman (în prezent în judeţul Cluj). Din păcate, data sa de naştere nu este cunoscută cu exactitate. Astfel, în unele surse de documentare, anul naşterii este notat 1838. A fost elev la Blaj, apoi a studiat pedagogia la Budapesta. Ulterior s-a

Primit la redacţie: 7 august 2014; *Acceptat spre publicare:* 30 august 2014;
Adresa: Universitatea de Medicină şi Farmacie "Iuliu Haţieganu" Cluj-Napoca, Disciplina Ştiinţe Socio-umaniste şi Istoria Medicinii, Str. Avram Iancu, 31, Cluj-Napoca, 400083
E-mail: cristianbarsu@yahoo.com

întors în Transilvania, pentru a-şi face o carieră didactică. A predat gimnastica în învăţământul catolic, reformat şi unitarian din Cluj. Deoarece condiţiile de existenţă de pe meleagurile natale erau dificile, Moceanu a fost determinat să se refugieze în România (Cheţianu, 1939). În 1862 s-a stabilit la Bucureşti, unde a fost sprijinit de istoricul, scriitorul şi omul politic Vasile Urechea-Alexandrescu (1834-1901) şi de generalul şi omul politic Ioan Emanoil Florescu (1819-1893). Începând din 1863, până la finele secolului al XIX-lea, Moceanu a fost profesor de gimnastică la liceele „Sfântul Sava", „Matei Basarab" şi „Sfântul Gheorghe" din Capitală. De asemenea, a predat această materie la Şcoala Militară de Ofiţeri (2).

De notat faptul că un alt transilvănean - chimistul Nicolae Teclu (1839-1916) - în perioada 1863-1869, cât a fost profesor la Gimnaziul Român din Braşov, „a pus bazele unei mişcări modeste de educaţie fizică - atât cât putea să existe în condiţiile precare ale epocii" (Bologa, 1960). Chiar dacă strădania sa nu a avut atunci un ecou amplu, totuşi ea a avut o consecinţă importantă: orientarea lui Moceanu spre pedagogia educaţiei fizice (Bologa, 1960).

Moceanu a fost primul profesor de gimnastică din România, care a căutat să introducă exerciţiile fizice în programa analitică a elevilor. Datorită iniţiativei sale, în 1864 gimnastica a fost inclusă ca obiect facultativ în liceele din România.

O altă componentă a educaţiei fizice, pe care a promovat-o Moceanu, a fost educaţia fizică a femeii.

Tot la sugestia lui Moceanu s-a legiferat introducerea gimnasticii în armată. De subliniat faptul că Moceanu a avut meritul de a fi organizat, în colaborare cu Carol Davila (1828-1884), gruparea „Micii dorobanţi". Scopurile organizaţiei au fost următoarele: dezvoltarea fizică a tineretului, pregătirea sa militară şi trezirea conştiinţei naţionale la români (Bocu & Vidu, 2008).

Pe plan ştiinţific cea mai valoroasă lucrare a sa a fost „Gimnastica raţională pentru uzul şcolilor primare, secundare şi superioare" (1889). Acesta a fost o premieră în literatura de specialitate din România (Bârsu, 2007). De asemenea, a scris: „Carte de gimnastică" (1869), „Şcoala de patinaj şi înot" (1892) ş. a.

Prin activitatea sa din acest domeniu, el a pus în practică dictonul poetului antic Aristofan (c. 446-c. 385 î. H.), conform căruia „gimnastica pune zăvor bătrâneţii şi nu o lasă să intre în corpul omului" (Aristofan, citat de Popescu, 1983).

Gheorghe Moceanu a devenit celebru şi prin activităţi realizate peste hotare. A asociat arta cu educaţia fizică, utilizând dansurile naţionale ca mijloace de educaţie fizică. A efectuat turnee de dansuri româneşti pe patru continente. În 1878 a condus un ansamblu artistic român la Paris, prezentând pentru prima dată dansuri populare româneşti. Cu acest grup a organizat turnee şi spectacole la: Roma (1882), Madrid (1884), Calcutta (1886), New York, Cleveland şi Chicago (1893) (Cheţianu, 1939). Impresiile culese din aceste deplasări le-a lăsat posterităţii sub formă literară: „Călătoriile mele prin Europa, Asia, Africa şi America". Aprecierea acestei cărţi se evidenţiază prin faptul că în anul 1899 a fost publicată a treia ediţie a sa.

Aşa cum a arătat unul dintre cei mai importanţi organizatori ai învăţământului românesc interbelic Constantin Kiriţescu (1876-1965): „Moceanu a dezvoltat o activitate neobosită şi entuziastă, de adevărat apostol al unei idei noi. Predând toate felurile de gimnastică, scrimă şi - cu deosebită dragoste - dansurile populare româneşti, el a reuşit să propage în cercuri largi gustul pentru exerciţiile gimnastice, a atras o mulţime de tineri şi a creat o pleiadă de elevi şi continuatori" (Kiriţescu, 1930). El a format prima pleiadă de profesori şi maeştri de gimnastică din ţară, printre care: Nicu Velescu, Simion Petrescu şi Andrei Bagov. Totuşi, Moceanu nu a fondat o şcoală de gimnastică, în înţelesul cuprinzător al acestei noţiuni (Kiriţescu, 1930).

Dintre numeroasele exemple de apreciere ale contemporanilor faţă de Moceanu şi de realizările sale, un exemplu sugestiv este evocarea pe care Nicolae Iorga (1871-1940) i-a consacrat-o în 22 septembrie 1909. „El s-a aşezat la noi [n. n. - s-a stabilit în România] pentru a îndeplini o operă pe care, după ideile şi puterile lui, a şi săvârşit-o. A dat o întreagă pleiadă de gimnastici îndrăzneţi, eroici, de artişti de echilibristică şi mândria lui era să-i poată arăta străinătăţii, smulgându-i aplauzele" (Iorga, 1967).

Relevăm un aspect inedit din activitatea pedagogică a lui Moceanu: el a avut-o elevă pe Cella Delavrancea (1887-1991), care a devenit celebră pianistă, profesoară şi scriitoare. Mai mult decât atât, el îl avusese elev pe scriitorul, dramaturgul şi omul politic Barbu Ştefănescu Delavrancea (1858-1918) - tatăl Cellei. Ca profesor de gimnastică la Pensionul de fete „Miller-Verghy" din Bucureşti, Moceanu a pus accentul pe efectuarea exerciţiilor la trapez. Cella Delavrancea a ţinut să sublinieze faptul că „ne încânta sfârşitul lecţiei, când, agăţate pe mici trapeze ritmam cu picioarele elanul, învârtind zburătoarea în cerc mare, care ne ridica deasupra pământului" (Delavrancea, 1987). Astfel, Moceanu a dovedit faptul că în tinereţe fusese şi acrobat (Ionescu, 1991). De aceea, el a iniţiat gimnastica acrobatică pe plan naţional.

După trei decenii de la stingerea din viaţă a lui Moceanu, Onoriu Cheţianu i-a consacrat o amplă evocare în care a pus în evidenţă ideea fundamentală a lui Moceanu: gimnastica este „un excelent mijloc de educaţie şi nicidecum un simplu exerciţiu pentru întărirea muşchilor" (Cheţianu, 1939). În plus, Cheţianu a subliniat faptul că toată activitatea lui Moceanu a fost călăuzită de „nevoile şi aspiraţiile neamului său", căruia a căutat „să-i deschidă drumuri noi spre înălţare" (Cheţianu, 1939).

Scurtă privire asupra contextului social în care Moceanu a activat în România

Activitatea de promovare a gimnasticii, pe care Moceanu a desfăşurat-o cu succes în România, s-a înscris în şirul de modernizări ale societăţii româneşti din a doua jumătate a veacului al XIX-lea. În acest sens ar fi de amintit faptul că spre sfârşitul aceluiaşi secol, ţara noastră a fost denumită simbolic „Belgia Orientului". În 1882 a fost introdus iluminatul electric în România. Doi ani mai târziu în Bucureşti a intrat în funcţiune telefonul. În 1889, la Capitală a început să circule cel dintâi automobil cu patru cai putere. După cinci ani, tot în Capitală a avut loc prima proiecţie cinematografică (Bulei, 2004). Modernizarea societăţii româneşti a fost influenţată de modelul francez. Este semnificativ faptul că spre sfârşitul secolului al XIX-lea, în România franceza era limba obligatorie în toate

liceele care aveau durata studiilor de şapte sau opt ani. Tot atunci în liceele din ţara noastră a fost introdusă programa şcolară de sorginte franceză (Niţelea, 2000).

Considerăm util să precizăm faptul că în acea perioadă în România încă nu se manifesta cu claritate corelaţia dintre sport şi unele activităţi propagandistice. În timp, aceasta s-a cristalizat, având ca unul dintre modele situaţia din Franţa. Acolo, spre sfârşitul veacului al XIX-lea gimnastica şi natația au devenit piloni ai educaţiei şcolare, având atât un rol în ansamblul măsurilor de igienă, adică de „creştere raţională a speciei umane", cât şi un scop patriotic (Frioux, 2012). Tot în Franţa, după eşecul războiului din 1870, s-a încercat cultivarea spiritului naţional prin diverse metode, inclusiv prin practicarea organizată a sportului (Caritey & Carrez, 2002).

Cartea „Istoria, anatomia şi higiena gimnasticii, după cei mai însemnaţi autori, cu figurile principale şi textul explicator al băilor şi şcolii de înotat" alcătuită de Gheorghe Moceanu

Aşa cum am amintit, unul dintre scopurile lucrării noastre este prezentarea unei cărţi rare, alcătuită de Moceanu. Titlul său este: „Istoria, anatomia şi higiena gimnasticii, după cei mai însemnaţi autori, cu figurile principale şi textul explicator al băilor şi şcolii de înotat". Ne referim la a patra ediţie a acesteia, care a fost publicată în 1881, la Bucureşti. Faptul că acest volum a fost reeditat de câteva ori atestă succesul pe care l-a avut.

Cartea are formatul „de buzunar" şi conţine numeroase ilustraţii. Limbajul folosit este simplu şi uşor de înţeles pentru cititori.

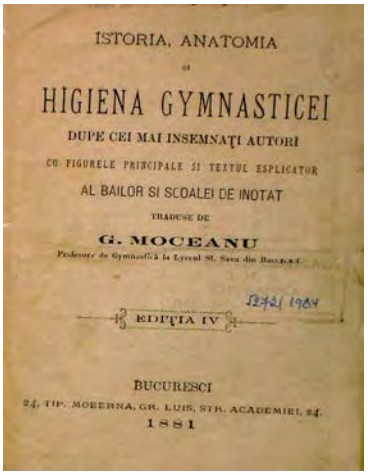
Acest volum nu reprezintă o lucrare originală. De aceea, nici numele lui Moceanu nu este înscris în partea de sus a copertei, respectiv a paginii de titlu. În acest sens trebuie subliniat corectitudinea lui Moceanu, care a menţionat în introducere faptul că a alcătuit acest volum traducând capitolele de istoria, anatomia şi igiena gimnasticii dintr-o carte scrisă de Junot şi Senglet, la care a adăugat câteva figuri şi explicaţii dintr-un studiu despre băile şi şcoala de înot, scris de Moritz Kloss (1818-1881). El a fost directorul Institutului Regal de Gimnastică din Dresda timp de peste trei decenii - din 1850 până la decesul său. De asemenea el este considerat ca fiind unul dintre fondatorii gimnasticii pentru femei (1). Foarte puţine date sunt disponibile despre Alfred Junot şi despre Senglet. Se ştie faptul că ei au fost profesori de educaţie fizică la Paris. Cartea lor care i-a făcut cunoscuţi a fost lucrarea „Gimnastica populară raţională". Ea a văzut lumina tiparului în 1873. Deci alegerea sa de către Moceanu pentru a fi tradusă în limba română s-a bazat pe celebritatea ei.

Volumul lui Moceanu a fost publicat în toamna anului 1881. Nu se poate şti exact când a fost editat, dar prefaţa sa a fost datată de Moceanu în iunie 1881. Se poate considera că această carte a fost un *in memorian* pentru Kloss, care a încetat din viaţă în septembrie 1881.

Trebuie de subliniat faptul că Moceanu i-a ales pe autorii din care a tradus acest volum doar din două ţări: Franţa şi Germania. Prin cultura şi ştiinţă lor, aceste naţiuni aveau un mare prestigiu la sfârşitul veacului al XIX-leaîn România. Pe lângă francofonia românilor, exista şi certă influenţa germană, datorată conducătorului Regatului României.

Se poate pune întrebarea: de ce Moceanu nu a ales şi alte surse de documentare pentru a alcătui această carte ? Probabil datorită faptului că interesul lui era să pună rapid la dispoziţia celor interesaţi un volum cu noţiuni variate de gimnastică şi de înot şi nu să elaboreze o sinteză complexă a literaturii de specialitate din diferite ţări.

Publicul pentru care a fost alcătuit acest volum a fost reprezentat în majoritate de elevi.


ISTORIA, ANATOMIA

HIGIENA GYMNASTICEI

DUPE CEI MAI INSEMNAŢI AUTORI

CU FIGURELE PRINCIPALE ŞI TEXTUL EXPLICATOR

AL BAILOR SI SCOALEI DE INOTAT

TRADUSE DE

G. MOCEANU

EDIŢIA IV

BUCURESCI

1881

Fig. 1 – Coperta cărţii lui Moceanu.

Prima parte a acestei scrieri prezintă istoria prescurtată a gimnasticii, noţiuni despre morfologia şi fiziologia aparatului locomotor şi despre igiena exerciţiilor fizice. În a doua parte a acestei lucrări el a notat câteva aspecte despre înot. Partea finală a volumului lui Moceanu conţine diferite exerciţii care se pot face cu puşca, cu o pârghie, cu o bară de lemn sau de fier. Trebuie de subliniat faptul că în selecţia unor exerciţii fizice pe care le-a recomandat în această carte, Moceanu nu s-a limitat la opiniile autorilor din care a făcut traducerile, ci a ţinut cont de opinia celebrului medic Carol Davila, care le-a apreciat ca fiind utile pentru a fi introduse în programa şcolilor primare de băieţi.

Nu ne-am propus să detaliem aceste exerciţii. Menţionăm doar faptul că acestea aveau grade diferite de dificultate, de la ridicarea şi coborârea unui bare orizontale, până la exerciţiile în care era utilizat helcometrul. Acesta este folosit pentru dezvoltarea forţei musculare. El funcţionează pe principiul învingerii rezistenţei unei greutăţi reglabile, care este ridicată şi coborâtă prin intermediul unor scripeţi (Marcu, Maneca, 1986).

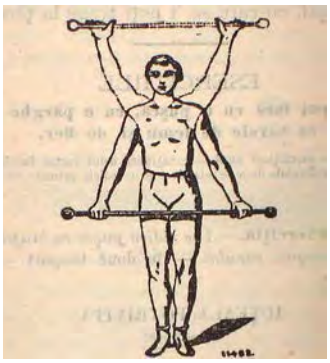


Fig. 2 – O etapă a unui exerciţiu de gimnastică propus de Moceanu.

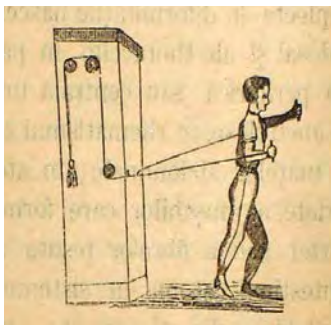


Fig. 3 – Utilizarea helcometrului, preconizată de Moceanu.

Fig. 4 – Studiu pentru mişcările aruncării cu bumerangul.

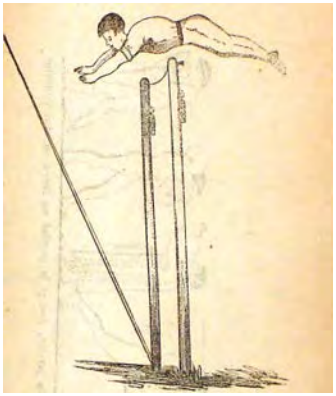


Fig. 5 – Studiu pentru mişcările săriturii cu prăjina.

Datorită faptului că această carte prezintă şi noţiuni de anatomie, Mihai Ionescu (1928-1997) l-a inclus pe Gh. Moceanu în Dicţionarul de anatomişti, editat în 1991.

Privind per ansamblu realizările lui Moceanu, se poate afirma în mod temeinic faptul că el a fost începătorul unei noi epoci de dezvoltare a învăţământului de gimnastică în şcoală şi armată, a pregătirii de profesori şi a înfiinţării de societăţi de educaţie fizică. Într-adevăr tot ceea ce a fost întemeiat în acest domeniu timp de trei decenii a fost opera lui Moceanu şi a elevilor săi (Niculescu, 2006).

Concluzii

1. Gh. Moceanu a fost întemeietorul învăţământului de educaţie fizică din România.

2. Contribuţia sa în acest domeniu a fost deosebit de semnificativă, de aceea a fost apreciat de numeroşi contemporani ai săi. Inedită este opinia pozitivă pe care a avut despre el una dintre elevele sale - Cella Delavrancea.

3. Cartea „Istoria, anatomia şi higiena gimnasticii, după cei mai însemnaţi autori, cu figurile principale şi textul explicator al băilor şi şcolii de înotat", alcătuită de Gh. Moceanu reprezintă una dintre primele lucrări de educaţie fizică destinate elevilor din România.

4. Această carte nu este originală, ci este o selecţie pe care Moceanu a efectuat-o, ţinând cont de experienţa pe care şi-o formase prin predarea gimnasticii în diferite şcoli din Bucureşti.

5. Lucrarea a avut succes, datorită stilului său direct şi a numeroaselor desene pe care le conţine.

6. Deşi acest volum al lui Moceanu a avut succes la sfârşitul secolului al XIX-lea, totuşi a rămas foarte puţin cunoscut, în raport cu alte cărţi mai importante pe care el le-a elaborat.

Conflicte de interese

Nu există.

Bibliografie

Bârsu C. O evocare a lui Gheorghe Mocianu, primul profesor român de educaţie fizică. Palestrica Mileniului III - Civilizaţie şi sport, 2007;28(2):75-77.

Bocu T, Vidu O. Serbări omagiale la Orman - Gheorghe Moceanu. Palestrica Mileniului III - Civilizaţie şi sport, 2008; 9(2):155-157

Bologa VL. Începuturile fazei ştiinţifice în medicina culturii fizice la noi. Extras din Studii şi cercetări de medicină (Cluj), 1960 (XI):184.

Bulei I. Modernitatea. Între realizări şi contradicţii. În: O istorie a românilor, Ed. Meromia, Bucureşti 2004, 107.

Caritey B, Carrez M. Sport et propagande en Europe (XIXe - XXe siècle). Cahiers d'histoire. Revue d'histoire critique, 2002 (88):14.

Cheţianu O. 100 de ani de la naşterea lui Gheorghe Mocianu primul educator fizic român. Tipogr. „Cartea Românească", Cluj 1939, 5-10.

Delavrancea C. Mamiţica. În: Dintr-un secol de viaţă, Ediţie îngrijită de Râpeanu V, Ed. Eminescu, Bucureşti 1987, 29.

Frioux St. L'État éducateur ou l'hygiène par l'école. În: Frioux St, Fournier P, Chauveau S. Hygiène et santé en Europe de la fin du XVIIIe siècle aux lendemains de la Première Guerre mondiale, Ed. Sedes, Paris 2012, 223.

Ionescu M. Dicţionar de anatomişti. Ed. Litera, Craiova, 1991, 247

Iorga N. Oameni care au fost. Vol. I, Editura pentru literatură, Bucureşti 1967, 219.

Kiriţescu C. Educaţia fizică în România. În: Educaţia fizică parte fundamentală a educaţiei şcolare integrale, Ed. „Cartea Românească", Bucureşti 1930, 129.

Marcu F, Maneca C. Dicţionar de neologisme, ediţia a III-a, Ed. Academiei R. S. România, Bucureşti 1986, 517.

Niculescu G. Scurt istoric privind apariţia şi evoluţia gimnasticii pe plan mondial şi naţional. În: Gimnastica în kinetoterapie. Ed. Fundaţiei România de Mâine, Bucureşti 2006, 22.

Niţelea M. Receptarea valorilor franceze în viaţa cotidiană a elitei bucureştene (1866-1914). În: Bucureşti. Materiale de istorie şi muzeografie, vol. XV, Ed. Muzeul Municipiului Bucureşti, Tipogr. „Universul" SA., Bucureşti 2000, 183.

Popescu I. Maxime şi reflecţii medicale alese. Ed. Medicală, Bucureşti 1983, 72.

Websites

(1) http://clio.revues.org/1855 Accesat în iulie 2014

(2) http://www.romgym.ro Accesat în august 2014

RECENT PUBLICATIONS
ACTUALITĂŢI EDITORIALE

New Romanian publications in the field of sports
Publicaţii româneşti recente în domeniul sportului

RAFA. Povestea mea
Rafael Nadal, John Carlin
Editura Victoria Books, Bucureşti, 2014
248 pagini

Cartea de faţă ne face să ne punem următoarea întrebare: „Pe cine interesează viaţa lui Rafael Nadal ?". Însă din momentul în care începem s-o citim, ni se deschide în faţă „sufletul" şi momentele cele mai importante din viaţa unui mare campion, Rafael Nadal, considerat unul din cei mai buni şi mai tenace jucători de tenis din lume.

Dacă stai să-l priveşti cum joacă pe teren, îţi spui că, spre deosebire de alţi jucători, Nadal s-a născut special pentru acest sport.

Cartea este o autobiografie scrisă de Nadal, cu ajutorul cu John Carlin, şi prezintă momente din copilăria, adolescenţa şi maturitatea lui şi cel mai important prezintă meciul de tenis din turneul de la Wimbledon din 2008 împotriva lui Roger Federer, meci pe care-l mai pierduse de două ori tot împotriva lui Federer.

Acest meci este considerat unul din cele mai lungi meciuri de finală, durata lui a fost de cinci (5) ore, terminat cu un set de 9-7. O recomand cu căldură celor care vor să afle ce înseamnă tenisul, cât este de dur, de scump să-l practici, câtă muncă stă în spatele prestaţiei pe teren, dar... în acelaşi timp, cât este de frumos, atât fizic şi mental.

Mijloace pentru însuşirea tehnicii jocului de fotbal
Gheorghe Grigore
Editura Universitară, Bucureşti, 2012
113 pagini

Fotbalul a fost şi va rămâne totdeauna unul din sporturile favorite , pentru că fiecare sportiv de pe teren are un rol anume şi desfăşoară un adevarat spectacol şi pentru că, numai „decantarea" acestui spectacol individual într-un întreg măreşte spectaculozitatea, stârneşte pasiuni în rândul spectatorilor.

Ca orice sport de performanţă trebuie să aibă „o asigurare de viitor" ca să-i spunem aşa, această asigurare fiind reprezentată de „pepinierele" de copii şi juniori, care cresc alături de echipele de fotbal.

În ajutorul acestei munci titanice vine şi această carte „Mijloace pentru însuşirea tehnicii jocului de fotbal" a cărei autor este Gheorghe Grigore, care oferă studenţilor, profesorilor, antrenorilor un set de mijloace ale tehnicii jocului de fotbal, repere practice din paşii metodologici pe care trebuie să-i parcurgă fiecare, în desfăşurarea activităţii.

Tehnica jocului de fotbal este precisă, fină şi suplă, în vederea controlării mingii în criza de spaţiu şi timp; de aici rezidă, în realitate, complexitatea, spectaculozitatea tehnicii folosite în jocul modern.

Reversul medaliei
Andreea Răducan
Editura Wiseman, Ploieşti, 2012
189 pagini

Despre această carte poţi să spui că citind-o treci printr-o stare de agonie şi extaz. De ce? Pentru că trebuie să rememorezi Olimpiada de la Sydney, când toţi am stat cu sufletul la gură în faţa televizoarelor urmărind prestaţia gimnastelor noastre la această Olimpiadă şi văzând nedreptatea la care a fost supusă Andreea Răducan.

Cartea se vrea o rememorare în urma căreia se aşteaptă şi în ziua de astăzi un răspuns ca să se poată înţelege absurdul situaţiei, stare pe care şi publicul de atunci nu a înţeles-o deloc.

„Reversul medaliei" scrisă de Andreea Răducan, este o carte emoţionantă pentru iubitorii gimnasticii sportive şi vreau să cred că nu numai pentru ei, în care ni se arată zbuciumul unei sportive de înaltă performanţă, care a găsit resurse de a merge mai departe şi de a ieşi cu fruntea sus dintr-o situaţie umilitoare la care a fost supusă şi alături de ea şi noi românii.

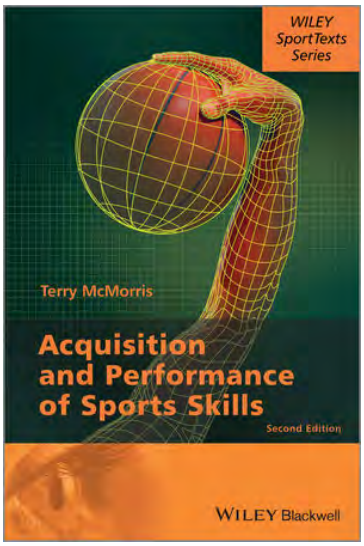
Vă recomand cu căldură lecturarea acestei cărţi, pentru că ne dă o lecţie de viaţă şi puterea de a merge mai departe.

Carmen Preja
apreja@yahoo.com

Palestrica Mileniului III – Civilizaţie şi Sport
Vol. 15, no. 3, Iulie-Septembrie 2014, 264–265

Book reviews
Recenzii cărţi

Acquisition and Performance of Sports Skills, 2nd Edition
(Învăţarea şi execuţia deprinderilor sportive, ediţia a 2-a)
Autor: Terry McMorris
Editura: Wiley-Blackwell, mai 2014
318 pagini; Preţ: € 44,40



La exact 10 ani de la apariţia primei ediţii, editura Wiley-Blackwell şi autorul vin cu o necesară şi aşteptată actualizare a unei lucrări de căpătâi, pentru toţi cei ce se pregătesc să predea educaţia fizică în şcoală, sau să antreneze, ori o fac deja, cu mai mult sau mai puţin succes, de ceva vreme. Pe aceştia din urmă, cum e şi de aşteptat, îi are cu deosebire în vedere cartea, şi autorul. Care, în însufleţitul său prolog, cu o umbră de invidie parcă, invocă trăirile cu totul speciale şi de mare intensitate de care cu îndreptăţire au parte antrenorii, în cazul unor realizări briliante ale elevilor lor, mai ales dacă respectivele execuţii sunt rezultatul unor îndelungate, sisifice repetări şi corecţii.

Într-o formulare succintă această carte ne prezintă tot ce se întâmplă, în plan mental şi neuropsihologic, atunci când executăm un element de tehnică sportivă şi, mai important, ne învaţă cum să achiziţionăm respectivul element tehnic. Iar întrucât autorul este un pedagog – profesor la Colegiul Universitar Chichester (UK) – structura cărţii respectă regulile unui tratat de bază: capitolele încep cu prezentarea obiectivelor şi se termină cu o secvenţă rezumativă, cu seturi de întrebări (ale căror răspunsuri sunt livrate în Anexa 2) pentru verificarea cunoştinţelor, precum şi cu o bibliografie suplimentară specifică. Ceea ce particularizează totuşi cartea este că, ori de câte ori se iveşte ocazia, autorul îl invită pe cititor să încerce să-şi analizeze cât mai în detaliu propriile experienţe şi execuţii. Este un sfat şi un îndemn pe care Terry McMorris îl lansează din convingerea că reactualizând analitic propriile experienţe şi trăiri, în contextul şi sub impresia celor transmise şi explicate de text, lectorul va înţelege mai bine fundamentele ştiinţifice ale unui procedeu tehnic sau altul, şi va avea ocazia să vadă, mai clar, cum experienţele sale se conformează, sau nu, principiilor şi teoriilor ştiinţifice etalate de autor. Dacă aceste analize, comparaţii şi interpretări aplicate/adaptate *ad hoc* vor fi şi verbalizate sau, şi mai bine, comunicate şi explicate în detaliu şi altora, conţinutul diverselor capitole, şi al cărţii în final, va fi mult mai complet, mai durabil şi mai „aplicativ" înţeles şi achiziţionat. O altă particularitate şi intenţie a autorului, izvorâtă din aceeaşi preocupare şi dorinţă de a se adresa cât mai direct şi pe înţeles potenţialilor cititori, inclusiv celor de altă limbă maternă, este utilizarea unei engleze accesibile şi evitarea deliberată a citărilor excesive. În sfârşit, pornind tot de la bogata şi îndelungata sa experienţă de pedagog, acolo unde este cazul şi/sau necesar, autorul abordează simultan problematica din perspectiva celor două mari şcoli de gândire ce marchează – confruntându-se, dar şi completându-se – psihologia sportivă din zilele noastre: teoria procesării informaţiei şi teoriile psihologiei ecologice. Este de altfel cea mai corectă şi înţeleaptă atitudine şi abordare în condiţiile în care, din păcate, încă nu avem o unică teorie, care ea singură să poată explica în totalitate, felul în care omul achiziţionează şi-şi perfecţionează diversele abilităţi, inclusiv cele sportive.

Ca şi vechea ediţie, dar cu unele titluri modificate, împreună cu „Concluziile" – numerotate şi ele – cartea are 11 capitole. La care se adaugă bibliografia, atât de utilul index şi trei anexe; dintre care a doua – cea mai importantă şi voluminoasă (14 pagini) – a fost deja menţionată mai sus.

Titlul primului capitol – *„Skill, ability and performance"* – este unul extrem de dificil de tradus în românește, datorită multiplelor sensuri şi nuanţe pe care fiecare dintre cele trei cuvinte componente le are în engleză. Neputând însă să-l lăsăm netradus, ne-am străduit să o facem, totuşi, iar în condiţiile în care este clar că aici termenul performance nu înseamnă ceea ce pare la prima vedere, adică performanţă, conştientizându-i imperfecţiunea, formularea la care ne-am oprit este: *„Deprinderile motorii, abilităţile şi execuţia lor"*. Cu atât mai mult cu cât, parcurgând cele 24 de pagini care-i urmează, clarificările au venit să-i completeze înţelesul. Astfel, capitolul defineşte mai întâi deprinderile motorii şi le clasifică după diversele criterii, precizează că în psihologie cuvântul abilităţi descrie „acţiunile înnăscute ce stau la baza execuţiilor îndemânatice" şi că numărul abilităţilor pe care le posedăm este determinat genetic. După care, în încheierea primei părţi, este analizată complexa problemă a interacţiunii dintre abilităţi şi deprinderile motorii. În secţiunea secundă a capitolului sunt prezentate, critic şi comparativ, teoriile învăţării şi execuţiei deprinderilor motorii, teorii pe care le-am amintit deja mai sus. Concluziv cumva, se reţine ideea necesităţii unei abordări hibride – autorul însuşi părând a se număra printre cei care o îmbrăţişează – care originează în adevărul indubitabil că fiecare şcoală de gândire are punctele sale forte; de exemplu, procesul de luare a deciziei, în cazul

teoriei procesării informaţiilor, respectiv explicarea mişcărilor, în cazul psihologiei ecologiste.

„Senzaţiile şi percepţia informaţiilor externe” se intitulează capitolul al doilea, iar conţinutul său se structurează tot în raport de cele două principale şcoli de gândire, de care vorbeam în alineatul precedent. De o atenţie deosebită în context se bucură – cum este şi normal – simţul vederii, atenţia vizuală în speţă, atât datorită rolului său cheie în majoritatea sporturilor, cât şi ca urmare a clarificărilor recente în domeniu, favorizate de extinderea utilizării tehnologiei de urmărire live a direcţiei privirii (eye tracker). Faţă de ediţia anterioară, în care capitolul 3 se intitula simplu *„Luarea deciziei”*, acum avem *„Luarea deciziei şi memoria de lucru”*. Completarea are importanţa sa, ea reflectându-se şi în structura şi textul capitolului, dat fiind că unul dintre obiectivele acestuia îl reprezintă tocmai înţelegerea rolului pe care memoria de lucru (asimilată în esenţă memoriei de scurtă durată) îl are în luarea deciziei. Perspectiva pe care teoria sistemelor dinamice o aruncă asupra problemei îndeplinirii obiectivelor, precum şi evoluţia funcţiei cognitive în copilărie, şi mai târziu, reprezintă de asemenea aspecte importante, cărora autorul le acordă atenţie şi spaţiu suficient, în context. Despre *„Timpul de reacţie”*, cu toate variantele sale, ne vorbeşte capitolul ce vine în continuare, iar intr-o succesiune logică îi urmează *„Anticiparea”;* a cărei supralicitare în sport nu este deloc întâmplătoare, dacă ne gândim la frecvenţa şi importanţa pe care o au, pentru rezultatul confruntărilor, acţiunile de interceptare a diverselor obiecte (cel mai frecvent a mingilor), dar şi la rolul crucial al anticipării acţiunilor adversarului. Două cuvinte esenţiale în sport, în general şi în contextul temei cărţii, în special, denominează conţinutul capitolului 6: *„Controlul motor”*. Textul debutează cu încercarea de a clarifica o problemă ce suscită în continuare controverse – interacţiunea dintre sistemul nervos central şi cel periferic, în controlul mişcărilor – scoţând în evidenţă rolul feedback-ului, în special al celui proprioceptiv. Organizarea eferenţei, programele motorii, ghidajul vizual al mişcărilor şi evoluţia controlului motor pe parcursul anilor de viaţă ai individului, sunt aspecte de a căror stăpânire ţine indiscutabil înţelegerea controlului motor şi aplicarea cunoştinţelor respective în practică, de unde şi spaţiul tipografic semnificativ pe care autorul li-l acordă.

Titlul capitolului 7 este simplu, dar cât de bogat în înţelesuri şi conexiuni: „*Memoria*”. În viziunea adepţilor şcolii de gândire respective, memoria – definită de Tulving (1985) drept capacitatea organismelor de a beneficia de experienţele lor trecute – reprezintă baza atât de des invocatei teorii a procesării informaţiilor. Dar, întrucât rolul memoriei în luarea deciziilor a fost clarificat într-un capitol anterior, cea mai mare parte a celui de-al 7-lea examinează modul în care funcţia memoriei este implicată în învăţare, în speţă în învăţarea motorie. De unde şi atenţia specială acordată acestui tip de memorie, şi analiza extensivă a factorilor care condiţionează şi influenţează procesul de memorare (retenţia) şi cel de uitare (ştergerea), în cazul memoriei motorii de scurtă şi lungă durată. Următoarele două capitole sunt alocate ţintit „învăţării”, primul dintre ele purtând titlul: *„Învăţarea I: tipuri, teorii, stiluri şi măsurare”*. În cadrul lui, autorul începe cu prezentarea învăţării explicite, a celei implicite şi a repetării mentale, după care trece la descrierea succintă a teoriilor cognitive ale învăţării, neuitând să ne arate şi felul cum este privit şi înţeles procesul de învăţare, din perspectiva teoriei sistemelor dinamice; totul, desigur, centrat pe învăţarea motorie. După cum se ştie însă, orice activitate poartă amprenta personalităţii celui ce-o derulează; drept care McMorris trece în revistă şi stilurile de predare/antrenare ce pot fi întâlnite, cu avantajele şi dezavantajele lor, după care încheie cu menţionarea şi explicarea mai multor teste utilizate pentru evaluarea învăţării. Urmează *„Învăţarea II: instruirea, exersarea, transferul antrenamentului şi feedback-ul”,* capitol al cărui titlu este de asemenea mult mai sugestiv pentru ce conţine, decât telegraficul *„Exersarea (practice)”,* din prima ediţie. Totuşi, abia parcurgându-i cu toată atenţia paginile, avem posibilitatea să accedem la cele mai noi cunoştinţe şi viziuni, în problematicile indicate de respectivul titlu. Lectura merită tot efortul, deoarece în acest fel vom afla acele noutăţi şi detalii care contează, despre diferitele tipuri de exersare (antrenare) şi vom înţelege pe deplin natura si efectele interferenţei contextuale şi ale variabilităţii antrenamentelor, vom stăpâni pe deplin aspectele teoretice şi aplicative ale transferului antrenamentului, precum şi pe acelea ale feedback-ului (vizual, proprioceptiv, vestibular sau auditiv, respectiv intrinsec sau extrinsec) care, corect şi cu înţelepciune folosit, poate fi de mare ajutor în practica învăţării şi perfecţionării motorii.

Al 10-lea şi ultimul capitol propriu-zis al cărţii (pentru că cel de-al 11-lea cuprinde doar concluziile), ne aduce la zi în ce priveşte *„Motivaţia, starea de trezire/trezie (arousal), învăţarea şi performanţa”*. Ştim bine că există mai multe teorii ale motivării, iar sinteza evident aplicată la sport pe care ne-o oferă cartea de faţă, chiar merită să fie studiată cu toată atenţia. La fel este cazul şi cu partea a doua a capitolului, ţinând seamă că în ea sunt colectate şi sistematizate, clarificările cele mai recente (inclusiv cele de neurofiziologie a scoarţei cerebrale) privind interrelaţia dintre starea de trezire/excitaţie şi performanţa (calitatea, rezultatul) execuţiilor. Ideea principală, fundamentală de altfel, este că în cazul fiecărui individ trebuie bine cunoscut, şi atent indus şi monitorizat/menţinut, acel nivel de excitaţie (trezire) care asigură performanţele cele mai bune, de care este capabil sportivul în momentul respectiv al carierei sale. Ceea ce, se poate spune, este o adevărată artă, datorită faptului că respectivul nivel se află, din păcate, în imediata vecinătate a supraexcitaţiei, evident nocivă performanţei.

După cum se poate vedea în prezentarea de mai sus, există destule motive ca specialiştii noştri să se aplece asupra conţinutului unei cărţi, care le poate fi de real ajutor atât pentru actualizarea bagajului lor teoretic de cunoştinţe, cât şi în activitatea practică, dacă este cazul. Iar dacă pledoaria noastră nu se va fi dovedit suficient de persuasivă, le mai aducem la cunoştinţă că au posibilitatea de a-şi configura o imagine mai completă despre această carte, „frunzărind”, sau citind „din scoarţă în scoarţă”, prima ei ediţie, pe site-ul:

http://basketcoach.sportsontheweb.net/00003%20Acquisition%20and%20Performance%20of%20Sport%20Skills.pdf .

Gheorghe Dumitru
gdumitru@seanet.ro

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 266–267

EVENTS
EVENIMENTE

The Gheorghe Moceanu Days (3)
Zilele Gheorghe Moceanu (3)

1838-1909

Gheorghe Moceanu, this brilliant child of a peasant, born in a hidden villlage near the Someşul Mic river, managed to leave his natal environment and become the first teacher of gymnastics, fencing and folk dancing, a promoter of physical education and sport in Romania. After completing his middle and pedagogical education, he became a teacher of gymnastics at the ”Sfântul Sava” and ”Matei Basarab” high schools in Bucharest. Along with Spiru Haret, he contributed to the modernization of Romanian education by introducing gymnastics in schools and the army, by elaborating the first physical education curricula. His name is also associated with the writing of the first book on gymnastics (followed by other 12 books), the training of specialized teaching staff, the organization of sports competitions, cultural and sports events in Europe, America and India. In collaboration with outstanding personalities of science and politics, such as Carol Davila, he founded the ”Micii Dorobanţi” group, aimed at the harmonious physical development of young people, their military training, the awakening of the national consciousness in Romanians. During the course of his activity, he even received the support of King Carol I.

In 2008, on the 170th anniversary of the birth of the great son of the Orman village, as well as of sport in Romania, the foundations of a valuable tradition of recalling Gheorghe Moceanu's memory were laid. That year, with the support of the Mayor's office and of the Local Council of Iclod, the anniversary events reached their third edition. Over the years, the celebrations organized on this occasion have become increasingly diversified, bringing together the former sons of the village from all over the country, as well as the current inhabitants of the village and the neighborhood. Thus, on 16-17 August 2014, in the picturesque locality of Orman, people old and young gathered to celebrate 105 years since the disappearance of Gheorghe Moceanu.

The Gheorghe Moceanu days started on Saturday, August 15th 2014, when a new event for the inhabitants of the commune took place: the Street Football Championship final of the Iclod commune. Remarkable events continued on the day of August 17th. The proceedings were opened by the mayor of the Iclod commune, Emil Pârţoc, also known by his activity at the Romanian Rugby Federation, who warmly welcomed all participants. The nicely decorated Culture House of the village proved to be too small for the multitude of those interested in the event.

The solemn moment was the occasion for a heart manifestation: 16 couples of the locality who turned 50 years of marriage were congratulated and awarded diplomas and an amount of money.

The cultural and sports manifestations benefited from the presence of personalities in the field of sport - Prof. Dr. Traian Bocu, editor-in-chief of the Palestrica of the Third Millennium journal, and Assoc. Prof. Dr. Mihai Cucu from Cluj-Napoca, who both evidenced the importance of Prof. Gheorghe Moceanu for the development of physical education and sport in schools, for the promotion of folk dance as part of the curriculum.

The rich artistic program offered by the ”Valea Someşului” Folk Dance Ensemble from Gherla, by the ”Someş Dancers” group of Iclod and by the young dancers from the commune's schools was highly praised by the public. A taekwando demonstration also took place, which was followed with particular interest by the entire audience.

The events of 16-17 August 2014, which were carefully and skillfully organized, offered all those present the occasion to recall the special personality of Gheorghe Moceanu, as well as to meet the former and current sons of the village in a pleasant and festive setting.

* * *

Gheorghe Moceanu, acest genial copil de ţăran, născut într-un sat ascuns în vecinătatea Someşului Mic, a reuşit să iasă din mediul natal şi să devină primul dascăl de gimnastică, scrimă şi dansuri populare, promotor al educaţiei fizice şi sportului în România. După terminarea studiilor medii şi pedagogice, a devenit profesor de gimnastică la liceele „Sfântul Sava” şi „Matei Basarab” din Bucureşti. Alături de Spiru Haret a contribuit la modernizarea învăţământului românesc prin introducerea

gimnasticii în şcoli şi armată, prin elaborarea primelor programe şcolare de educaţie fizică. Tot de numele său se leagă scrierea primei cărţi de gimnastică (urmată de alte 12), activitatea de formare a cadrelor de specialitate, organizarea unor competiţii sportive, turnee cultural-sportive prin Europa, America şi India. Colaborând cu mari personalităţi ale ştiinţei şi politicii, cum ar fi Carol Davila, a înfiinţat gruparea „Micii Dorobanţi", cu scopul dezvoltării fizice armonioase a tineretului, pregătirii sale militare, trezirii conştiinţei naţionale la români. Pe parcursul activităţii sale a primit chiar şi sprijinul Regelui Carol I.

În anul 2008, cu ocazia împlinirii a 170 de ani de la naşterea marelui fiu al satului Orman, precum şi al sportului din întreaga România, Gheorghe Moceanu, s-au pus bazele temeinice ale unei tradiţii valoroase de a evoca amintirea lui. În acest an, prin grija Primăriei şi a Consiliului Local Iclod, evenimentele comemorative au ajuns la a III-a ediţie. Pe parcursul anilor, manifestările organizate cu această ocazie au devenit din ce în ce mai diversificate, reuşind să adune atât foştii fii ai satului răspândiţi în diferite colţuri ale ţării, cât şi pe locuitorii actuali şi ai împrejurimilor. Astfel, în zilele de 16-17 august 2014, în pitoreasca localitate Orman, lumea s-a întâlnit cu mic cu mare la comemorarea a 105 ani de la dispariţia lui Gheorghe Moceanu.

Zilele „Gheorghe Moceanu" au debutat sâmbătă 15 august 2014, când a avut loc un eveniment inedit pentru locuitorii comunei: Finala Campionatului de Fotbal al Străzilor din Comuna Iclod. Evenimentele remarcabile au continuat în ziua de 17 august. Lucrările au fost deschise de primarul comunei Iclod, Emil Pârţoc, cunoscut şi prin activitatea domniei sale în cadrul Federaţiei Române de Rugbi, acesta urând un călduros bun venit tuturor participanţilor. Frumos împodobitul Cămin Cultural al satului s-a dovedit neîncăpător, pentru multitudinea celor interesaţi de eveniment.

Momentul solemn a dat prilejul unei manifestări de suflet: 16 perechi din localitate, care au împlinit 50 de ani de căsnicie, au fost felicitate şi premiate cu diplome şi cu un plic cu o sumă de bani.

Manifestările cultural sportive s-au bucurat de prezenţa unor personalităţi din domeniul sportului - Prof. Univ. Dr. Traian Bocu, redactor şef al revistei Palestrica Mileniului III, respectiv Conf. Univ. Dr. Mihai Cucu din Cluj-Napoca - ambii reliefând importanţa profesorului Gheorghe Moceanu în dezvoltarea educaţiei fizice şi sportului şcolar, în promovarea dansului popular în programa şcolară.

Bogatul program artistic oferit de Ansamblul de dansuri populare „Valea Someşului" din Gherla, de formaţia „Dansatorii de pe Someş" a comunei Iclod şi de micii dansatori din unităţile de învăţământ de pe raza comunei a fost deosebit de apreciat de public. S-a desfăşurat, de asemenea, o demonstraţie de taekwando, urmărită cu interes deosebit de întreaga asistenţă.

Evenimentele din 16-17 august 2014, organizate cu grijă şi pricepere, au oferit celor prezenţi prilejul de a-şi aduce aminte de personalitatea deosebită a lui Gheorghe Moceanu, dar şi pentru a se reîntâlni pentru foştii şi actualii fii ai satului într-un cadru plăcut şi festiv.

Mihai Cucu
cumihai2001@yahoo.com

Palestrica of the third millennium – Civilization and Sport
Vol. 15, no. 3, July-September 2014, 268–269

EVENTS
EVENIMENTE

The annual meeting of the veteran athletes of „U" Cluj club (20)
Întâlnirea anuală a atleţilor veterani de la clubul „U" Cluj (20)

This year there was a meeting marking the 20th anniversary of the event. More and more veterans respond to this meeting that has become traditional. Along with the old generation represented as usual by Aurel Palade Ursu, Alexandra Taifas-Sicoe, Marilis Cuţui, Dora Copândean, Emma Konrad-Jenei, Grigore Cojocaru, Mircea Pop, Ilarie Măgdaş, Virgil Grobei, former athletes of the younger generations were present: Vasile Bogdan, Eva Zörgö, Karoly Ráduly, Mariana Nedelcu, Agepsina Rusu, Draga Comşa and many more. More than 30 veterans of different generations participated in this meeting.

The event was opened by Prof. Dr. Vasile Bogdan, Dean of FEFS, after which several veterans were invited to speak. Medals and participation diplomas were handed out. Pictures were taken, and a moment of socialization followed.

The moment of the opening of the event by Prof. Dr. Vasile Bogdan, Dean of FEFS (second from the left), flanked by Aurel Palade Ursu and Mircea Pop (right) and Traian Bocu (left). Behind them, the obelisk monument raised to the memory of Dr. Ioan Arnăut.

* * *

Anul acesta a fost o întâlnire marcată de cea de a 20-a aniversare a evenimentului. Tot mai mulţi veterani răspund acestei întâlniri devenită tradiţională. În afara vechii generaţii reprezentată ca de obicei de Aurel Palade Ursu, Alexandra Taifas-Sicoe, Marilis Cuţui, Dora Copândean, Emma Konrad-Jenei, Grigore Cojocaru, Mircea Pop. Ilarie Măgdaş, Virgil Grobei, au fost prezenţi şi foşti atleţi din generaţiile mai tinere, precum Vasile Bogdan, Eva Zörgö, Karoly Ráduly, Mariana Nedelcu, Agepsina Rusu, Draga Comşa şi mulţi alţii. Au participat la această întâlnire peste 30 de veterani din generaţii diferite.

Deschiderea evenimentului a fost făcută de Prof. dr. Vasile Bogdan Decanul FEFS, după care au fost invitaţi la cuvânt şi câţiva dintre veterani. Au fost înmânate plachete şi diplome de participare. Au fost făcute fotografii, după care a urmat un moment de socializare.

Some of the big names of the event. From the left: Ani Plăcintaru (sister of Gheorghe Plăcintaru), Dora Copândean, Emma Konrad-Jenei, Marilis Cuţui, Aurel Palade Ursu, Alexandra Taifas-Sicoe, Emilia Bozero-Sarukan, László Tuka.

Award giving ceremony - Alexandra Taifas-Sicoe.

Handing of awards to veterans Virgil Grobei and Gheorghe Cojocaru (standing to the left), by Vasile Bogdan, in the presence of Vasile Sarucan (standing to the right). Sitting on the bench (from the foreground): Rodica Lupau, Dumitru Oltean, Gheorghe Monea, Ilarie Măgdaş, Mrs. Grobei.

In the foreground, Dora Copândean. In the background, Traian Bocu, Vasile Bogdan and Alexandra Taifas-Sicoe.

From the left: Rodica Lupău, Florica Iuşan, Maria Marta, Agepsina Rusu, Geta Dumitrescu-Monea, Mariana Nedelcu, Eva Zorgo, Cruciţa Călugăr, Draga Comşa, Ioana Ciupei.

Two of the ”veterans” of the young generation - Eva Zörgö-Ráduly and Károly Ráduly.

The joy of the reunion: Agepsina Rusu, Rodica Lupău, Prof. Dumitru Oltean, Georgeta Dumitrescu-Monea, Maria Marta, Mariana Nedelcu, Florica Iuşan (down).

Traian Bocu
traian_bocu@yahoo.com

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.

Palestrica Mileniului III – Civilizaţie şi Sport
Vol. 15, no. 3, Iulie-Septembrie 2014, 273–275

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.