

# **PALESTRICA OF THE THIRD MILLENNIUM - CIVILIZATION AND SPORT**

*A quarterly of multidisciplinary study and research*

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and  
The Romanian Medical Society of Physical Education and Sports  
in collaboration with  
The Cluj County School Inspectorate

A journal rated B+ by CNCS (Romanian National Research Council) since 2007,  
certified by CMR (Romanian College of Physicians) since 2003,  
CFR (Romanian College of Pharmacists) since 2015 and CMDR since 2018

A journal with a multidisciplinary approach in the fields of biomedical science,  
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A journal indexed in international databases:  
EBSCO, Academic Search Complete, USA  
Index Copernicus, Journals Master List, Poland  
DOAJ (Directory of Open Access Journals), Sweden  
CiteFactor, Canada/USA  
CrossRef, Lynnfield, MA (US)/Oxford (UK)

# 2

Vol. 19, No. 2, April-June 2018

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Telephone: 0264-598575  
E-mail: palestrica@gmail.com

pISSN 2601 - 2537  
eISSN 2601 - 2545  
ISSN-L 2601 - 2537  
www.pm3.ro

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## ORIGINAL STUDIES

# The role of occupational therapy in children with Down's syndrome

*Rolul terapiei ocupa ionale la copiii cu sindrom Down*

**Lucratorii: Alexandra Apetrei<sup>1</sup>, László Irsay<sup>2</sup>, Monica Borda<sup>2</sup>, Rodica Ungur<sup>2</sup>, Ioan Onac<sup>2</sup>, Viorela Ciornea<sup>2</sup>**

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### Abstract

**Background.** The role of occupational therapy in the functional development and social reintegration of children with Down's syndrome.

**Aims.** The improvement of fine motor and ADL skills, social and communication skills, participation in group games and cooperation skills.

**Methods.** The present paper is a primary study based on case series, conducted on children with Down's syndrome in Cluj-Napoca in their home environment. The research involved the application of an occupational therapy program to a group of 5 children with Down's syndrome, consisting of 2 boys and 3 girls, aged 5 to 11, over a period of 6 weeks. The program consisted of 2 sessions per week, each with a duration of 50 minutes. Progress was quantified using data collected through assessment scales, as follows: the Waisman Activities of Daily Living (W-ADL) scale, the finger dexterity test (FDT), the hand dexterity test (HDT) and Ozeretski's dynamic coordination of hands test (DCHT). The tests were performed on days 1 and 42 of treatment.

**Results.** Specificity was calculated by comparing the results obtained upon conducting the study on the same group of subjects at those points during treatment using the T-Paired Two Sample for Means test. The significance levels were measured at 95% for  $p < 0.05$  and 99% for  $p < 0.01$ . Upon performing the W-ADL, FDT, HDT and DCHT tests, the following results were obtained: W-ADL –  $p = 0.03$ ,  $p < 0.05$ ; FDT - left hand:  $p = 0.01$ , right hand:  $p = 0.006$ ,  $p < 0.05$ ; HDT -  $p = 0.01$ ,  $p < 0.05$ ; DCHT - left hand:  $p = 0.006$ , right hand:  $p = 0.003$ ,  $p < 0.01$ ;

**Conclusions.** Upon conducting the research, the main occupational therapy program objectives were achieved. Also, important considerations were formulated regarding the improvement of ADL performance by means of increased levels of independence, an improved quality of life and improved sensory and fine motor skills as a result of symptom improvement.

**Keywords:** Down's syndrome, occupational therapy, rehabilitation medicine

### Rezumat

**Premize.** Aportul terapiei ocupa ionale în dezvoltarea func ional i reintegrarea social a copiilor cu sindrom Down.

**Obiective.** Îmbun t irea abilit ilor motrice fine, a aptitudinilor pentru realizarea activit ilor de zi cu zi i dezvoltarea aptitudinilor de socializare, comunicare, participare la jocuri de grup i cooperare.

**Metode.** Aceast lucrare este un studiu primar bazat pe serii de cazuri, efectuat pe copii cu sindrom Down din Cluj-Napoca, la domiciliul fiec rui participant. Cercetarea a constat într-un program de terapie ocupa ional aplicat unui grup de 5 copii cu sindrom Down, dintre care 2 bă ie i i 3 fete, cu vârsta cuprins între 5-11 ani, pe o perioad de 6 săptămâni, 2 ore pe săptămân , 50 minute pentru fiecare edin . Pentru cuantificarea evolu iei s-au utilizat date ce au fost colectate din scalele de evaluare: Waisman Activities of Daily Living (W-ADL), testul dexterit ii degetelor (finger dexterity test- FDT), testul dexterit ii mâinilor (hand dexterity test- HDT) i testul de coordonare dinamic a mâinilor (testul Ozeretski - the dynamic coordination of hands test- DCHT), care au fost aplicate în ziua 1 a programului i respectiv în ziua 42.

**Rezultate.** Pentru determinarea specificit ii, s-a utilizat testul T- Paired Two Sample for Means de compara ie a rezultatelor pe acela i grup de subiec i în cadrul celor dou momente. S-au ob inut valori ale pragului de semnif ca ie în propor ie de 95% pentru  $p < 0,05$  i 99% pentru  $p < 0,01$ . În urma aplic rii testelor s-a ob inut pentru testul WADL ( $p = 0,03$ ,  $p < 0,05$ ), pentru FDT (mâna stâng :  $p = 0,01$ ; mâna dreapt :  $p = 0,006$ ,  $p < 0,05$ ), pentru HDT ( $p = 0,01$ ,  $p < 0,05$ ) i pentru efectuarea DCHT (mâna

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Received: 2018, January 11; Accepted for publication: 2018, February 15

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<https://doi.org/10.26659/pm3.2018.19.2.81>

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stâng : p=0,006 i mâna dreapt : p=0,003, p<0,01).

**Concluzii.** În cadrul programului de terapie ocupa ional , obiectivele principale ale studiului au fost atinse i s-au adus considerente importante în gradul de realizare a activit ilor de zi cu zi prin dezvoltarea nivelelor de independen , precum i cre terea calit ii vie ii, a achizi iilor în cadrul func iei motorii f ne i a celei senzoriale prin reducerea simptomatologiei.

**Cuvinte cheie:** sindrom Down, terapie ocupa ional .

## Introduction

### General considerations

Langdon Down disease, also known as trisomy 21 or mongoloidism, is the f rst and most commonly encountered chromosomal abnormality among humans. There is an increased probability for people with Down's syndrome to present with health problems, such as dysmorphia, developmental delay or a malformation syndrome (Vlad et al., 2012).

Generally, children with Down's syndrome present a set of mental and physical characteristics, such as cognitive, behavioral disorders or learning disabilities, speech, communication and short-term memory delays, f ne or gross motor def cits (Delavarian et al., 2012), ataxia or hypotonia (Lauteslager et al., 1998). Motor impairment may result in slow movements, lack of precision, reduced stability and coordination. Also, it affects the non-physiological motor mechanisms, also known as compensatory mechanisms.

Due to a particular brain structure, patients with Down's syndrome need extended periods of time to collect, process, interpret and manage information. Numerous authors associate this particularity with motor and cognitive development delays (Agulló et al., 2006).

Most patients with Down's syndrome present several physical particularities, as follows:

1. hypotonia in association with a poor Moro ref ex, ligamentous hyperlaxity and instability - reduced muscle strength causes instability in the joint structures and therefore, motor coordination, walking and also f ne motor impairment (Weijerman & de Winter, 2010); hypotonia can be marked, moderate or mild, each form affecting the child's walking timeline as shown in Table I (Martinez & Martinez, 2008); the most affected joints are the weight-bearing joints (i.e. hip, knee) and the atlanto-axial joint (Vlad et al., 2012);

**Table I**  
Walking timeline in hypotonic children

Grades of hypotonia	Age (months)
Marked hypotonia	28.90 months
Moderate hypotonia	23.84 months
Mild hypotonia	22.94 months

2. brachycephaly, round fattened face, protruding tongue, small ears, short neck, loose skin at the nape of the neck, short broad hands, incurving little f ngers (clinodactyly), often single transverse palmar crease (Croockshank's crease or simian crease), dermatoglyphic abnormalities (excess of ulnar or radial loops on the distal line), short lower limbs, collapsed plantar arches, short toes with gaps between the hallux and second toe, short height (max. 140-160 cm in adults), often accompanied by obesity, delayed and problematic sexual development (Weijerman & de Winter, 2010).

The diagnosis of Down's syndrome in neonates and infants can be confirmed based on the clinical criteria presented in Table II (\*\*\*, 2008).

**Table II**  
The cardinal symptoms of Down's syndrome in neonates and infants (after Hall, 1966)

Symptoms	Incidence rate
Muscular hypotonia	100%
Poor Moro ref ex	85%
Flat facial profile	90%
Upslanting palpebral f ssures	80%
Small low-set round ears	60%
Loose skin at the nape of the neck	80%
Simian crease	45%
Ligamentous hyperlaxity	80%
Hip dysplasia	70%
Clinodactyly	60%
The presence of 6 out of 10 symptoms supports a Down's syndrome diagnosis	

Low postural tone prevents co-contraction, i.e. balance and feedback, during walking. Thus, the motor development of children with Down's syndrome is affected by postural control impairments (Lateslager et al., 1998), or cerebellar hypoplasia, which include cerebral maturation or pathophysiological processes (Malak et al., 2015).

Along with ligamentous and capsular hyperlaxity, hypotonia causes instability in most joints and therefore, impaired imbalance and motor coordination. Obesity can also be considered as one of the factors that affect posture, strength, movement and grasp stability (Agulló et al., 2006).

The role of occupational therapy within a rehabilitation program is to train an individual's participation in activities of daily living and undertaking of signif cant tasks of life, as well as to improve educational development and management, participation in leisure activities and social participation, among other major functions (Irsay & Popa, 2016).

Occupational therapy activities focus on and are adapted depending on the child's and family's needs. The occupational therapist focuses on the development of target areas, such as personal grooming, participation in education, play and leisure, motor and sensory rehabilitation.

The parents' participation also represents a very important factor as they can assist their children in the learning process through planned and unplanned play and structured teaching (Cre u et al., 2010).

In the context of the participation of children with Down's syndrome in occupational therapy activities, the occupational therapist must take into consideration a number of principles, as follows:

- Making sure that the child is not tired as a result of the activities performed.
- Following the child's pace and dynamics and showing patience in their achievement of the best results by engaging them in the activities performed.
- Encouraging the child to make various objects, and

keeping them after the therapy sessions.

- Maintaining interaction with the child and adapting the conversation to suit their age.

- Assessing the level of independence, as well as the manual and intellectual skills achieved by the child on a constant basis.

- Making sure that intellectually or physically demanding activities are not followed by any manual ones (Dan, 2005).

#### *The workspace*

The environment where the occupational therapy sessions take place must meet the following conditions:

- It must be set up in a quiet space, with big tall windows, which does not cause any distractions.

- The furniture must be adapted to the child's needs.

- It must be equipped with objects for everyday use, such as paper, bottles, etc., as well as objects to be used for exercises and exploration (Dan, 2005).

Certainly, there is an entire set of factors that bear an influence on the process of fine motor development, such as movement, sight, sensory integration, visual proprioception or cognitive capacity, as well as socio-cultural factors. Most programs involving fine motor development consist of hand exercises and activities. Fine motor skill development therapy includes bimanual coordination, prehension, hand dexterity and single grip development, strengthening of hand muscles needed for self-serving, performing activities of daily living and successive motor actions (Lersilp et al., 2016). The success rate of a fine motor skill rehabilitation program must be, by all means, continuous and systemized.

Fine motor skill development is directly linked to speech (pronunciation and language) and thinking development, thus playing a role in the development of intelligence (Haraszosi et al., 2015). This relationship between the two is supported by recent research, whereby fine motor skills have a significant impact on the school performance of children with Down's syndrome (Memišević & Maćak, 2014).

## **Hypothesis**

The issues of compliance and success of occupational therapy programs among children with Down's syndrome have been raised numerous times, the debate leading to the conclusion that occupational therapy plays a paramount role within rehabilitation programs due to its contribution to social integration and participation in group activities.

The formation of children with Down's syndrome as future adults must begin in childhood. Therefore, the earlier occupational therapy is undertaken, the more uniform will be their long-term progress.

The purpose of the present paper is to contribute to the integration of children with Down's syndrome in daily activities by means of ADL, I-ADL, fine motor skill and social integration development, as well as the establishment of relationships with family members and others using occupational therapy.

## **Material and methods**

The study was approved by the Ethics Committee and all parents whose children were included in the study agreed with the fact that the results of their evolution will

be used for research purposes and published.

#### *a) Period and place of the research*

The research group benefited from an occupational therapy program over a period of 6 weeks. The program consisted of 2 sessions per week, each with a duration of 50 minutes. The program was carried out in the participants' home environment in Cluj-Napoca between 30 April and 10 June 2017.

#### *b) Subjects and groups*

The research involved the application of an occupational therapy program to a group of 5 children with Down's syndrome, 2 boys and 3 girls, aged 5 to 11, over a period of 6 weeks.

The protocol was established on a weekly basis and carried out in accordance with the objectives. It consisted of approximately 3-4 activities adapted to suit the participants' age and cognitive levels, based on their initial assessment, as follows:

#### *Week 1*

##### *1. Grip, precision and prehension improvement*

- Playing pinch pin games - pinch pins are attached around color-coded shapes and then removed

- Screwing/unscrewing lids - various types and sizes of lids are used

- Playing the Octoplus game

##### *2. Getting dressed/undressed & adjusting clothing items*

- Simulating the process of getting dressed – using buttoned pillow cases, zipped pillow cases, shoe lacing, etc.

- Adjusting footwear – using stickers which are put inside in order for the footwear to be worn correctly

- Improving dental hygiene – educational games, bite plane exercises

#### *Week 2*

##### *1. Hand coordination development*

- Playing tennis ball games – catching and throwing

- Playing mosaic games – grasping and placing game pieces by pressing

- Using scissors to cut over thick lines

- Building pasta towers

##### *2. Personal grooming and sensory stimulation*

- Simulating hand washing by playing with the hands in a bowl filled with couscous

- Toilet training – step-by-step education on using the toilet, modifying the environment to facilitate access to the toilet, sink, soap, towel

- Preparing for bedtime – step-by-step education: tooth brushing, putting on the pajamas, making the bed

#### *Week 3*

##### *1. Coordination, perception and memory development*

- Using card boxes – fitting animal flashcards into their corresponding spaces

- Using post boxes – fitting sticks in different shapes into their corresponding spaces

- Fitting geometrical shapes into their corresponding color-coded spaces

##### *2. Graphomotricity*

- Drawing lines using various models

#### *Week 4*

##### *1. Coordination, precision, grip and aesthetic development*

- Playing the Fruit Basket game – gluing various fruit shapes to a board
- Playing the Farm Animals game – gluing various animal shapes to a specially designed board
- Doing a simple two-piece jigsaw puzzle – putting the pieces of the puzzle together as per a given image
- Playing the Tooth game – gluing pieces of cotton to a board in the shape of a tooth

*2. Development of skills necessary for table setting and chores*

- Playing with a specially designed tableware board – fitting tableware items into the corresponding spaces according to their shape
- Rolling the carpet
- Slicing fruit using plastic knives and making fruit salad

*Week 5*

*1. Bimanual coordination and fine grip development*

- Playing with themed beads, such as animal or flower beads, and laying them out in their corresponding spaces
- Making necklaces and bracelets out of beads
- Modeling clay figures
- Playing with Lego games – building towers
- Playing the Egg Carton game – placing cotton/clay balls in the color-coded egg carton

*2. Development of cooperation and participation in group/team games*

- Playing the Couscous Box game – hiding objects inside the box for the others to find
- Doing puzzles in groups
- Drawing/painting in groups

*Week 6*

*1. Writing re-education and correct desk positioning while writing*

- Using a correct pencil grip
- Modifying objects to facilitate use (e.g. replacing thick pencils with thin ones)
- Developing and maintaining a correct position and posture at the desk (i.e. hands on the desk, holding the paper with one hand while writing)

*2. Sensory education*

- Hand-fishing for rubber fish in a bowl containing hydrophilic balls
- Fishing for objects in a bowl filled with rice
- Exploring new sensations – playing with sensory

balls, touching and bubble wraps, walking on fluffy carpets and cold/hot tiles barefoot

*c) Tests applied*

The motor skills and daily activities of children with Down’s syndrome were assessed using three motor tests and one ADL test, as follows: the hand dexterity test (HDT) to assess the motor control of their hands, the finger dexterity test (FDT) to assess their fine motor skills in both hands, Ozeretski’s dynamic coordination of hands test (DCHT) to assess their dynamic coordination in both hands, and the Waisman Activities of Daily Living (W-ADL) scale to assess the level of independence in performing activities of daily living. The tests were performed on days 1 and 42 of treatment by the same person.

The participants in the study were assessed in multiple stages. The participation of their caregivers was necessary. Parental consent was obtained to access the children’s data and carry out the therapy sessions.

*d) Statistical processing*

The statistical analysis performed in this study aimed to highlight the statistically relevant differences between the results obtained upon assessment before and after the application of the occupational therapy program.

The results were compared using the paired two sample for means T-test to assess the same group of subjects on days 1 and 42 of treatment, and introduced in the Microsoft Excel 2007 spreadsheet program. The significance levels were measured at 95% and 99%.

**Results**

The rehabilitation protocol was followed by a new set of assessment tests upon completion. The results are indicated in Table III.

Upon quantification, on day 42 of treatment, the W-ADL test indicated an increase in the average value by 1.8, whereas the DCHT indicated a decrease in execution times by 2.8 seconds using the right hand and 2.9 seconds using the left hand. The FDT indicated a decrease in execution times by 17.2 seconds using the right hand and 11.8 seconds using the left hand. Finally, the HDT indicated an increase in the number of transferred cubes by 10.6. The results were compared to those obtained on day 1 of treatment.

The results obtained upon performing the T-test are described in Table IV.

**Table III**  
Results at a glance after 42 days

Patient	Day of treatment	W-ADL points	DCHT		FDT		HDT
			Seconds (s)		Seconds (s)		No. of cubes
			Left hand	Right hand	Left hand	Right hand	Both hands
1	1	20p	25.5s	18.5 s	120s	100s	35 cubes
	42	<b>22p</b>	<b>22s</b>	<b>17s</b>	<b>100s</b>	<b>85s</b>	<b>40 cubes</b>
2	1	21p	28.5s	24.5s	160s	149s	25 cubes
	42	<b>23p</b>	<b>24.5s</b>	<b>22s</b>	<b>145s</b>	<b>130s</b>	<b>30 cubes</b>
3	1	22p	24.5s	21s	113s	77s	38 cubes
	42	<b>25p</b>	<b>21.5s</b>	<b>18s</b>	<b>105s</b>	<b>55s</b>	<b>48 cubes</b>
4	1	20p	21.5s	20.5s	120s	100s	36 cubes
	42	<b>21p</b>	<b>19.5s</b>	<b>18s</b>	<b>112s</b>	<b>80s</b>	<b>44 cubes</b>
5	1	21p	28s	25s	140s	120s	24 cubes
	42	<b>22p</b>	<b>25.5s</b>	<b>22s</b>	<b>132s</b>	<b>110s</b>	<b>29 cubes</b>

**Tabel IV**

Signif cance for W-ADL, DCHT, FDT and HDT

W-ADL	DCHT		FDT		HDT
	Left hand	Right hand	Left hand	Right hand	
0.03	0.006	0.003	0.01	0.006	0.01

## Discussion

Development is a dynamic process involving the child's gradual transition from dependence on others to physical, social, psychological maturity in teenage years. The interaction with the family members or guardian plays a particular role in this dynamic process. Therefore, the child's performance must not be regarded in an isolated manner (\*\*\*, 2013). Thus, an early development of relationships and interaction with others plays a significantly positive role in their formation and thus, uniform development (Ferreira-Vasquez & Lamônica, 2015).

Due to their limited participation, the primary focus is the use of their habitual motor skills (i.e. motor skills related to the activities of daily living) in the home, school and public environments. Motor limitations as well as communication limitations affect their quality of life and thus, their socio-cultural integration, causing a low level of self-esteem in the future adults (Jackson et al., 2004; Dolva et al., 2004). The difficulties encountered throughout the application of the rehabilitation program were related to the level of engagement due to a rapid loss of interest.

The children showed a high level of interest in gluing activities, sensory games, table setting and household activities.

Female participants preferred sequencing activities, as well as bracelet or necklace making, whereas male participants showed particular interest in the Farm Animals gluing game, as well as memory and perception development games.

The limitations of the study were the reduced number of participants and the subjective data reporting and filling out of the Waisman questionnaire by their parents. The relatively short time span and the absence of a reference group can also be regarded as limiting factors.

## Conclusions

1. The present study focuses on the role of occupational therapy in children with Down's syndrome aged 5 to 11 years. The study group consisted of 60% female and 40% male participants.

2. The results obtained were positive and indicated modifications in all the assessed areas (finger dexterity, hand dexterity, dynamic coordination of the hands and ADL performance) between days 1 and 42 of treatment. The statistical data analysis revealed significance levels of 95% for  $p < 0.05$  and 99% for  $p < 0.01$ .

3. Research must be conducted over a minimum period of 6 weeks in order to obtain uniform results. In addition, it must focus on the specific effects of occupational therapy and be conducted on samples consisting of larger numbers of participants.

4. Multidisciplinary involvement and family interaction play an essential role in the achievement of objectives within a therapy program.

5. The achievement of objectives is facilitated by focusing on simple short tasks and continuity of therapy.

## Conflicts of interest

There were no conflicts of interest to declare. Parental consent was obtained to carry out the activities and publish the research data collected.

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# Effects of botulinum toxin type A on spasticity and hand function

*Efectele toxinei botulinice tip A asupra spasticității și a funcției mâinii*

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## Abstract

**Background.** Spasticity is well known as one of the most common after stroke complications, providing a series of negative effects including decreased range of motion, muscle spasm, different levels of contracture, local pain in the affected area.

**Aims.** Clinical-functional evaluation of the short and medium term effect of ultrasonographically guided injections with botulinum toxin type A (TxB-A) on the spasticity of the upper limb in post-stroke patients and the quantification of effects on international scales of spasticity and functionality.

**Methods.** The groups studied were composed of 60 patients, which were divided based on the doses provided in each muscle of the hand and wrist flexors (250 IU versus 333 IU). Every patient received a total dose of 1000 IU of TxB-A. The parameters that were assessed were: Modified Ashworth Scale (MAS) and Activities of Daily Living Scale (ADL), international scales for spasticity and functionality. The moments evaluated were: T0 (the initial time – injection time), T1 (one month after the injection) and T2 (3 months from T0 or 2 months from T1).

**Results.** Evaluation of MAS and ADL scales from T0 to T1 and T2 for the 250 IU group shows great improvements at T1 on both scales, MAS (<0.001) and ADL (<0.001), while maintaining the efficacy at T2, MAS (p-value 0.214), ADL (p-value 0.166). Evaluation of MAS and ADL scales from T0 to T1 and T2 for the 333 IU group also shows effective improvements on both scales at T1, MAS (<0.001), ADL (<0.001), and T2, MAS (0.849), ADL (0.013). Correlations between the two groups, 250 IU vs 333 IU, performed for each of the scales used in the study evidenced better results at T1 in favor of the 333 IU group on both MAS (p-value 0.034) and ADL score (p-value 0.078), with the proportion maintained in favor of the 333 IU group at T2, MAS (p-value 0.024), ADL (p-value 0.035).

**Conclusions.** a) TxB-A is efficient as a prime line treatment for spasticity, helping the patients in the muscle neurorehabilitation effort; b) TxB-A is effective in reducing spastic muscle tone (MAS); c) TxB-A is a useful asset in managing hand function (ADL).

**Keywords:** spasticity, botulinum toxin type A, muscle neurorehabilitation exercise

## Rezumat

**Premize.** Spasticitatea este bine cunoscută ca fiind una dintre cele mai frecvente complicații ale accidentului vascular cerebral, având o serie de efecte negative care includ scăderea amplitudinii de mișcare, spasme musculare, contracturi de diferite intensități, dureri în zona afectată.

**Obiective.** Evaluarea clinic și funcțională a efectului injecțiilor ghidate ecografic cu toxina botulinică tip A (TxB-A) în spasticitatea membrului superior la pacienții cu status post-accident vascular cerebral și cuantificarea efectelor pe scale internaționale de spasticitate și funcționalitate.

**Metode.** Lotul studiat a cuprins 60 de pacienți, care au fost împărțiți în 2 loturi, în funcție de doza administrată în fiecare mușchi flexor al pumnului și al degetelor (250 UI și 333 UI). Fiecare pacient a primit o doză totală de 1000 UI de toxină botulinică de tip A. Parametrii evaluați au fost: Modified Ashworth Scale (MAS) și Activities of Daily Living Scale (ADL), scale internaționale pentru spasticitate și funcționalitate. Momentele evaluate au fost: T0 (timpul inițial - timpul de injectare), T1 (o lună după injectare) și T2 (3 luni de la T0 sau 2 luni de la T1).

**Rezultate.** Evaluarea efectelor TxB-A pe scalele MAS și ADL de la T0 la T1 și T2 pentru lotul cu 250 UI prezintă îmbunătățiri semnificative la T1 pe ambele scale MAS (<0,001), ADL (<0,001), menținând eficiența la T2, MAS (valoare p 0,214), ADL (valoare p 0,166). Evaluarea efectului pe scalele MAS și ADL de la T0 la T1 și T2 pentru lotul 333 UI arată, de asemenea, îmbunătățiri semnificative pe ambele scale la T1, MAS (<0,001), ADL (<0,001) și T2, MAS (0,849), ADL (0,013). Corelațiile dintre cele două loturi, 250 UI vs 333 UI, efectuate pentru fiecare dintre scalele utilizate în studiu, prezintă rezultate mai bune la T1 în favoarea lotului 333 UI, atât pe MAS (valoare p 0,034), cât și pe scorul ADL (valoare p 0,078), cu proporția menținută în favoarea grupului 333 UI la T2, MAS (valoare p 0,024) ADL (valoare p 0,035).

Received: 2018, April 6; Accepted for publication: 2018, April 28

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<https://doi.org/10.26659/pm3.2018.19.2.86>

*Concluzii.* a) TxB-A este un tratament de prim linie pentru spasticitate, ajutând pacienții în efortul de neuroreabilitare musculară; b) TxB-A este eficient în reducerea rezistenței musculare pasive (MAS); TxB-A este o metodă terapeutică utilă în ameliorarea funcționalității mâinii (ADL).

**Cuvinte cheie:** spasticitate, toxina botulinică tip A, efort de neuroreabilitare musculară

## Introduction

Spasticity is well known as one of the most common after-stroke complications (Liu et al., 2018). Lance in 1980 defined spasticity as a motor disorder characterized by a velocity-dependent increase in tonic stretch reflexes (muscle tone) with exaggerated tendon jerks, resulting from hyperexcitability of the stretch reflex, as a component of the upper motor neuron syndrome (Lance, 1980).

Spasticity has a series of negative effects on the affected subjects, including decreased range of motion of the upper or lower limbs, muscle spasm, different levels of contracture, local pain in the affected area (Thibaut et al., 2013; Gracies et al., 2010).

Decreasing spasticity is a hard task and not always an objective in the rehabilitation program. In some functional activities such as transfers, standing and walking, increased muscle tone is a facilitating positive sign of spasticity (O'Sullivan & Schmitz, 2016; Brashear & Elovic, 2015).

Despite being often used in managing spasticity, oral drugs offer a systemic treatment with relative benefit, and side effects are commonly dose limiting (Tickner et al., 2012).

Most studies reveal chemodenervation injections with botulinum toxin type A (TxB-A) as a first line treatment providing local action within a muscle or muscle group (Gracies et al., 2015), with very few cases of reported adverse effects (Rosales et al., 2012).

Ultrasound, electrical stimulation (ES), electromyography (EMG) and anatomic landmarks are different techniques of guidance when injecting TxB-A, with a wide range of studies evaluating their efficiency on functionality (Simpson et al., 2017; Walker et al., 2015).

Musculoskeletal ultrasound is a non-invasive, non-irradiating imaging method, repeatable whenever it is needed. It is performed in real time and provides complex morphological and hemodynamic information on musculoskeletal structures: muscles, tendons, joints (Bianchi & Martinoli, 2007).

## Objectives

a) Improvements of muscle resistance to passive movement on MAS

b) Improvements of hand function in ADL

c) Correlation between reducing muscle resistance to passive movement and hand function

## Hypothesis

Taking into consideration previous spasticity treatments with TxB-A with different guidance methods, US, ES, EMG, anatomical landmarks, we aimed to evaluate the efficiency of ultrasound guided TxB-A in the wrist and finger flexors in reducing muscle resistance to passive movement and improving hand function in order to reduce muscle neurorehabilitation exercise.

## Material and method

### a) Period and place of the research

The interventional observational study was performed in the Rehabilitation Department of the "Elias" Emergency University Hospital between September 2017 - March 2018. The study was approved by the Ethics Committee of the "Elias" Emergency University Hospital (08.08.2017), according to the Good Practice Guidelines. The patients who participated in the study gave their consent to the use and publication of the results for research purposes.

### b) Subjects and groups

The studied groups were composed of 60 patients who presented upper limb spasticity within 12 months of stroke, which were divided based on the doses injected in the wrist and finger flexors (250 IU versus 333 IU). Patients having received 250 IU were injected in 4 muscles, while those having received 333 IU were injected in 3 muscles. All patients received a total TxB-A dose of 1000 IU. The target muscles were pronator teres, flexor carpi radialis, flexor carpi ulnaris, flexor digitorum superficialis, flexor digitorum profundus, flexor pollicis longus.

### c) Tests applied

The following parameters were assessed: the Modified Ashworth Scale (MAS) and the Activities of Daily Living (ADL) Scale. MAS is an international tool which measures spasticity on a scale between 0 and 4, where 0 indicates the absence of spasticity and 4 indicates maximum intensity, meaning that the limb is fixed in flexion or extension. The ADL Scale is an 11-item scale which includes presumed personal care activities: bath and shower; bladder and gut function management; dressing; eating; food supply; functional mobility; maintaining one's own helping device; hygiene and personal care; sexual activity; rest and sleep; toilet hygiene.

### d) Statistical processing

The tests applied are described in Table I. It should be mentioned that most of the data are of scale type (this is the name as per the SPSS Statistics v22 tool used), but also ordinal. However, the comparison test type is the same, meaning that the tests below should be used when data are at least ordinal.

**Table I**  
Tests used according to the data type and distribution

Comparison type/data	Distribution	Comparison test used
Independent	Normal	Independent t-test
Independent	Non-normal	Mann-Whitney U test
Paired	Normal	Paired t-test
Paired	Non-normal	Wilcoxon matched paired test

The values used as reference were means whenever the distribution was normal for both data samples, or medians whenever at least one sample was not normally distributed. Mention: this is in fact what the comparison test is assessing.

All patients were evaluated at the initial time T0, which is the time where the ultrasound guided injections were performed after evaluating the patients for the target muscles. Spasticity was assessed using MAS and hand function was evaluated on the ADL Scale. The next evaluations were performed at one month (T1) and three months (T2) after the injection, to quantify the effect of the injections on the same evaluation scales (MAS, ADL).

Although spasticity has some common patterns for the upper limb after stroke, it can occur in any muscle, so that we chose the target muscles for each patient. Flexor muscles were evaluated individually and we noted a mean muscle spasticity value on MAS for each patient (e.g.: 1 patient; 333 IU group; spasticity of the flexor carpi ulnaris = 3 MAS; flexor digitorum profundus = 4 MAS; flexor pollicis longus = 3 MAS; average MAS of the patient = 3.33 MAS).

For the hand function we used the ADL Scale, an 11-item scale where we counted the activities that a person performs at the evaluation time (e.g.: eating, sleeping, clothing. ADL score = 3).

Apart from this perspective of comparing the 2 groups of patients (250 IU versus 333 IU), which was used as a criterion for independent comparisons, we also compared patients using paired-sample criteria: the same group was assessed from one period to another (T0-T1-T2) in order to evaluate the extent to which the injections improved the parameters.

**Results**

The results are presented in Tables II-XV.

Since the paper aims to show the effects of post stroke spasticity improvement based on the injected TxB-A dose, we first need to demonstrate that initially (at T0), the dose-based groups were homogeneous (Table II).

We compared the patients at T1 (one month after injection, in absolute values), as the T0 measurement was performed to validate patient homogeneity. Then, we com-

pared them at T2 (3 months after the injection).

At T1, in absolute values, it can be seen that one month after the injection there were significant differences between the two groups (Table III).

Thus, if at T1, in absolute values, the group that received 250 IU had a better score than the other group, from 1.92 to 1.63 on the Ashworth scale, in terms of percentage change (as percent increase / decrease at T1 compared to T0), this difference was not considered relevant; the average decrease of 36 percentage points (250 IU) compared to 43 (333 IU) was not significant.

At T2, in absolute values, significant differences were observed between the two groups formed depending on the dose received 3 months after the first injection. If those who received 250 IU had an average Ashworth score of 1.98, those who received 333 IU had an average score of 1.6. The difference in the median (we remind that the median is a statistically more relevant indicator for non-normal distributions, as is the case with one of the two groups) is even more visible (Table IV).

*a) 250 IU group*

Thus, one month after the first injection, a significant difference was found (with a p-value that is well below 0.05), which shows that injection itself is relevant (Table V).

It can be seen that there are no significant differences between one month and three months. The table above shows that the improved scale has, on average, almost the same value for both periods (Table VI).

*b) 333 IU group*

For the 333 IU group, we first found that Ashworth's decrease was statistically significant from T0 to T1.

It can be seen that similarly to the 250 IU group, the 333 IU group had an improvement without significant differences one month after the first injection compared to 3 months. This shows that the effect was important at 1 month, after which it was maintained for the next 2 months (Tables VII, VIII).

**Table II**

Statistical comparison of Ashworth at T0 based on the dose

T0: MAS	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
250 IU group	30	3	3	0.29	No	Mann-Whitney U	0.092
333 IU group	30	2.87	3	0.27	No		

**Table III**

Statistical comparison of Ashworth at T1 based on the dose

T1: MAS	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
250 IU group	30	1.92	1.88	0.5	Yes	Mann-Whitney U	0.034
333 IU group	30	1.63	1.66	0.58	No		

**Table IV**

Statistical comparison of Ashworth at T2 based on the dose

T2: MAS	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
250 IU group	30	1.98	2	0.58	Yes	Mann-Whitney U	0.024
333 IU group	30	1.6	1.33	0.64	No		

**Table V**

Statistical comparison of Ashworth between T0 and T1 for 250 IU

MAS	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
T0	30	3.01	3	0.29	No	Wilcoxon	<0.001
T1	30	1.93	1.88	0.5	Yes	Matched paired	

It can be observed that both groups had improvements at 1 month and 3 months, and although there were slightly higher averages in the 333 IU group, statistically speaking

the difference was not relevant between the groups (Tables X, XI, XII, XIII, XIV, XV).

**Table VI**

Statistical comparison of Ashworth between T1 and T2 for 250 IU

MAS	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
T1	30	1.93	1.88	0.5	Yes	Paired t-test	0.214
T2	30	1.98	2	0.58	Yes		

**Table VII**

Statistical comparison of Ashworth between T0 and T1 for 333 IU

MAS	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
T0	30	2.88	3	0.27	No	Wilcoxon matched paired	<0.001
T1	30	1.63	1.66	0.58	No		

**Table VIII**

Statistical comparison of Ashworth between T1 and T2 for 333 IU

MAS	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
T1	30	1.63	1.66	0.58	No	Wilcoxon matched paired	0.849
T2	30	1.6	1.33	0.64	No		

**Table IX**

Statistical comparison of ADL at T0 based on the dose

T0: ADL	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
250 IU group	30	3.27	3	1.413	No	Mann-Whitney U	0.059
333 IU group	30	3.87	4	1.252	No		

**Table X**

Statistical comparison of ADL at T1 based on the dose

T1: ADL	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
250 IU group	30	5.23	5	2.285	Yes	Mann-Whitney U	0.078
333 IU group	30	6.47	7	2.751	No		

**Table XI**

Statistical comparison of ADL at T2 based on the dose

T2: ADL	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
250 IU group	30	5.4	5	2.298	No	Mann-Whitney U	0.031
333 IU group	30	7.03	7	3.034	Yes		

**Table XII**

Statistical comparison of ADL at T0 and T1 for 250 IU

ADL	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
T0	30	3.27	3	1.413	No	Mann-Whitney U	<0.001
T1	30	5.23	5	2.285	Yes		

**Table XIII**

Statistical comparison of ADL between T1 and T2 for 250 IU

ADL	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
T1	30	5.23	5	2.285	Yes	Mann-Whitney U	0.166
T2	30	5.40	5	2.298	No		

**Table XIV**

Statistical comparison of ADL between T0 and T1 for 333 IU

ADL	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
T0	30	3.87	4	1.252	No	Wilcoxon matched paired	<0.001
T1	30	6.47	7	2.751	No		

**Table XV**

Statistical comparison of ADL between T1 and T2 for 333 IU

ADL	N	Average	Median	Standard deviation	Normal distribution?	Comparative test	p
T1	30	6.47	7	2.751	No	Wilcoxon matched paired	0.013
T2	30	7.03	7	3.034	No		

## Discussions

During the measurements, a technical disadvantage was observed in the fact that the dose was administered to different muscles (6) and given the low number of patients (60), the average muscle spasticity was used instead of scoring each of the six separate muscles. This of course opens the perspective of a future investigation given the significant results mentioned above.

All of our patients in the study received concomitant neurorehabilitation therapy, going from passive stretching to functional electrical stimulation. This is recommended by current guidelines in the treatment of upper limb spasticity, using TxB-A injections with concomitant therapies (Wissel et al., 2009).

The Ashworth scale for both the 250 IU and the 333 IU groups evidences a significant improvement 1 month after injection with the maintenance of the improvements 3 months after the injection. The ADL score has a minimal improvement at 1 month and a significant improvement at 3 months. This shows that after 1 month, when TxB-A was effective in reducing spastic muscle tone, the patients were able to exercise at a better intensity in order to improve hand function and the results were seen at 3 months.

For both 250 IU and 333 IU, there was a significant improvement at T1, showing that TxB-A is effective in reducing muscle resistance to passive movement, with a slight advantage on the Ashworth scale for the 333 IU group.

As the results of our study suggest, in an article published in February 2015, Andrea Santamato reviewed the use of higher TxB-A doses and showed that these were effective in reducing upper or lower limb spasticity after stroke (Santamato et al., 2015).

It can be seen that similarly to the 250 IU group, the 333 IU group had an improvement without significant differences one month after the first injection compared to 3 months. This shows that the effect is important at 1 month, after which it is maintained during the next 2 months. This can lead us to the idea of further studies to analyze the possibility of extending the period of injection to more than 3 months and to reevaluate the time lasting effect of TxB-A.

All patients in our study were within 1 year of stroke, and guidelines do not offer a time limit beyond which TxB-A may be considered ineffective in reducing symptoms (Fheodoroff et al., 2015).

A recent meta-analysis of 10 clinical trials using TxB-A shows global benefits in reducing upper limb spasticity after stroke in adults (Foley et al., 2013).

It has been demonstrated that early TxB-A injections after stroke (2-12 weeks) can induce important improvements in upper limb spasticity (Rosales et al., 2012) and also ameliorate arm function (Cousins et al., 2010). Current guidelines also show the possible advantages of early treatment with TxB-A in upper limb spasticity (\*\*\*, 2013).

This leads us to conduct further studies on a higher number of patients, while beginning the therapy at an earlier stage after stroke.

## Conclusions

1. TxB-A is a prime line treatment for spasticity, helping patients in the muscle neurorehabilitation effort; as shown in the study, patients had a better hand function on the ADL scale at 3 months, after TxB-A became effective, and they could exercise better.

2. TxB-A is effective in reducing muscle resistance to passive movement on MAS at 1 month after injection, with the maintenance of the effect at three months.

3. TxB-A is a useful asset in managing hand function, as shown on the ADL scale at 3 months after the injection for both groups (250 IU and 333 IU).

4. Further studies should be conducted in the future to establish the optimum dose-effect management of spastic muscles and the injection intervals.

## Conflicts of interest

Nothing to declare.

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## **Risks associated with sub- and overdosing of water-soluble vitamins in professional or amateur athletes and the quality of dietary supplements**

*Riscurile asociate subdozării/excesului unor vitamine hidrosolubile la sportivii de performanță sau amatori în calitatea suplimentelor alimentare*

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### **Abstract**

*Background.* Vitamins are the most commonly used active ingredients in dietary supplements (DS), and the quality of DS is subject to highly permissive legislation.

*Aims.* The purpose of this study was to underline the risks associated with sub- and overdosing of water-soluble vitamins in the case of performance and amateur athletes who use vitamins as dietary supplements without professional counseling and to test the quality of vitamins as DSs or drugs marketed in pharmacies through a new simple and rapid HPLC method.

*Methods.* Vitamins were analyzed by HPLC using a Phenomenex Luna C<sub>18</sub> column, 3 μm, 150 x 4.6 mm, a mobile phase with 100 mM ammonium acetate (pH = 5.8) - acetonitrile - methanol in a concentration gradient from 88:5:7 to 68:25:7 in 10 minutes with 1 ml/min flow rate. Sample processing: the vitamins from the tablets were extracted in 15 mM phosphoric acid and the injectable solutions diluted with 15 mM phosphoric acid prior to chromatographic analysis.

*Results.* The risk of overdosing water-soluble vitamins is highly questionable, but the under-dose intake is related to their use in the case of athletes, these vitamins being involved in energy metabolism. Hence the importance of the quality of commercial products with these vitamins. The proposed HPLC method allows the separation of ascorbic acid, folic acid, thiamine, pyridoxine, nicotinamide, cyanocobalamin and riboflavin. The linearity of the analytical method was tested and applied for five vitamin assays in tablets and injectable solutions purchased from the pharmacy, which were quantitatively analyzed, and the results were compared with those declared by the manufacturer.

*Conclusions.* Permissive legislation on DS implicates acquiring them from “safe” sources such as community pharmacies, especially for amateur athletes who do not benefit from specialized nutritional counseling.

**Keywords:** water-soluble vitamins, dietary supplements, HPLC method, quality control

### **Rezumat**

*Premize.* Vitaminele sunt cele mai utilizate substanțe active în compoziția suplimentelor alimentare, iar calitatea suplimentelor alimentare este supusă unor norme legislative extrem de permissive.

*Obiective.* Scopul acestui studiu a fost de a evidenția efectele negative pe care le are subdozarea/excesul de vitamine hidrosolubile în cazul sportivilor de performanță și amatori care utilizează vitamine fără consiliere profesională și de a testa calitatea unor suplimente alimentare și medicamente cu vitamine pe baza unei noi metode HPLC, simplă și rapidă.

*Metodă.* Vitaminele au fost analizate prin metoda HPLC, pe o coloană Phenomenex Luna C<sub>18</sub>, 3 μm, 150 X 4.6 mm, folosind ca fază mobilă un amestec de acetat de amoniu 100 mM (pH=5,8) – acetonitril - metanol, în gradient de concentrație de la un raport 88:5:7 la 68:25:7 în 10 minute, cu un debit de 1 ml/min. Prelucrarea probelor: tabletele au fost triturate în mojar și vitaminele au fost extrase în soluție de acid fosforic 15 mM, iar soluțiile injectabile au fost diluate cu acid fosforic 15 mM înaintea analizei cromatografice.

*Rezultate.* Riscul supradozării cu vitamine hidrosolubile este interpretabil, dar aportul lor insuficient este important mai ales în cazul sportivilor, aceste vitamine fiind implicate în metabolismul energetic. De aici este importantă calitatea produselor comerciale cu aceste vitamine. Metoda HPLC propusă permite separarea vitaminelor acid ascorbic, acid folic, tiamină, piridoxină,

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*Received:* 2018, March 25; *Accepted for publication:* 2018, April 20

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<https://doi.org/10.26659/pm3.2018.19.2.92>

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nicotinamid, cianocobalamin și ribofavin. A fost verificată linearitatea metodei analitice și apoi metoda a fost aplicată la analiza a cinci vitamine din tablete de suplimente alimentare și soluții injectabile cu vitamine, achiziționate din farmacie, aceea corespunzând din punct de vedere cantitativ cu conținutul declarat de producător.

**Concluzii.** Legislația permisivă din domeniul suplimentelor alimentare ridică problema achiziționării acestora din surse "sigure" precum farmaciile comunitare, mai ales în cazul sportivilor amatori care nu dispun de o consiliere nutrițională specializată.

**Cuvinte cheie:** vitamine hidrosolubile, suplimente alimentare, metodă HPLC, controlul calității.

## Introduction

Vitamins are indispensable substances, essential to humans, and intake of vitamins, especially from the water-soluble group, is practically associated in biochemistry with the proper development of energy processes (Schenk et al., 2018). Legislation in the field of dietary supplements (DS) raises serious problems regarding their quality, the variation limits of their composition in active compounds (\*\*\*, 2007), therefore the purchase source of such products is extremely important (pharmacies, naturist shops, Internet, etc.). The American Association of Poison Control Centers reported in 2016 that vitamin intoxications are rare, unintentional, especially in children, and in the literature, there are no cases of intoxications with water-soluble vitamins (Gummin et al., 2017). A study from 2010 shows that over 60% of performance athletes use dietary supplements, most of which contain multivitamins (52.2%) (Knez & Peake, 2010). If the risk of overdosing water-soluble vitamins is highly questionable, instead, there is the issue of under-dosed DS with vitamins, especially in the case of amateur athletes who, in the absence of pharmaceutical advice, use products purchased from sources that do not offer a guarantee for their quality.

## Hypothesis

Dietary supplements are not subjected to routine qualitative/quantitative control of their declared composition like medicinal products. Therefore, the purpose of this study was to analyze the water-soluble vitamin content of drugs and multivitamin DS purchased from the pharmacy based on the particular importance of these vitamins in energy metabolism of amateur athletes and the demand for high quality commercial products. Many analytical methods for the determination of the vitamin content of various drugs and supplements are described in the literature, the most widely used method being high performance liquid chromatography.

## Materials and methods

The quality control of the commercial products was performed with the aid of an HPLC system, Agilent Technologies 1100 series, USA, consisting of: single monitoring wavelength detector UV G1314A; column thermostat G1316A; autosampler G1329A; autosampler thermostat G1330B; quaternary pump G1311A; mobile phase degasser G1379A.

The chromatographic parameters were: chromatographic column - Phenomenex Luna C<sub>18</sub>, 3 μm, 150 X 4.6 mm; the mobile phase was delivered at a flow rate of 1 ml/min and the concentration gradient started with the initial composition ammonium acetate 100 mM pH 5.8 - acetonitrile - methanol 88:5:7; the composition was linearly changed in 10

minutes to 68:25:7, followed by a short washing step and reequilibration; the detector was set at 260 nm; the column temperature was 40°C; the sample injection volume - 10 μl.

Reference substances, ascorbic acid, thiamine, ribofavin, nicotinamide, pyridoxine and folic acid, were working standards provided by Ferrosan, Romania. For cyanocobalamin resolution, an injectable commercial pharmaceutical product was used.

The 5-level calibration curves were prepared in the following concentration ranges: 30-100 μg/ml thiamine, 13.5-45 μg/ml ribofavin, 15-50 μg/ml nicotinamide, 7.5-25 μg/ml pyridoxine and 30-100 μg/ml ascorbic acid.

DS and drug samples: DS tablets with the following composition: thiamine 2 mg, ribofavin 1 mg, pyridoxine 0.5 mg, ascorbic acid 30 mg, nicotinamide 1 mg, calcium pantothenate 1 mg; thiamine solution 50 mg/ml for injection containing thiamine hydrochloride; pyridoxine injection 25 mg/ml containing pyridoxine hydrochloride.

Sample processing was done as follows: 10 DS tablets were triturated in the mortar and an amount of powder corresponding to one tablet was dissolved by stirring in the ultrasonic bath in 15 mM phosphoric acid and filtered for analysis prior to HPLC analysis. Injectable solutions were diluted with 15 mM phosphoric acid to the proper concentration.

## Results

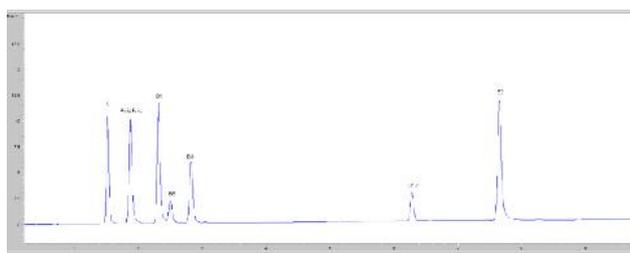
In the proposed chromatographic conditions, the substances in the standard calibration mixture were separated at the baseline with an experimentally determined dead time value  $t_0 = 1.34$  min (Fig. 1). Under the same conditions, seven water-soluble vitamins were separated at the baseline (Fig. 2).

In order to verify the linearity of the method, four calibration series were obtained and analyzed, and the obtained calibration curves are shown in Table I.

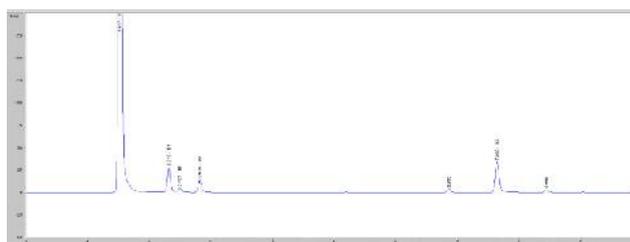
The results obtained for the determination of vitamins from DS and injectable solutions by the HPLC method are shown in Table II. The chromatogram of a tested commercial product is presented in Fig. 3.



**Fig. 1** – Chromatograms of a series of standard calibration solutions with the following order of elution: ascorbic acid (1.6 min), thiamine (2.3 min), pyridoxine (2.5 min), nicotinamide (2.8 min), ribofavin (6 min)



**Fig. 2** – Chromatogram of a mixture of 7 water-soluble vitamins under optimized HPLC conditions. The order of elution: C ascorbic acid (1.6 min), folic acid (1.9 min), B<sub>1</sub> - thiamine (2.3 min), B<sub>6</sub> - pyridoxine (2.5 min), B<sub>3</sub> - nicotinamide (2.8 min), B<sub>12</sub> - cyanocobalamin (6.4 min), B<sub>2</sub> - riboflavin (7.6 min)



**Fig. 3** – Chromatogram of the DS sample

**Table I**

The average calibration curves of the determined substances

Substance	Average calibration curve (N=4) ± SD	R <sup>2</sup>
Ascorbic acid	Area = 3.371 (±0.037) x c - 9.976 (±1.410)	>0.999
Thiamine	Area = 1.214 (±0.014) x c + 3.894 (±0.775)	>0.999
Riboflavin	Area = 3.348 (±0.024) x c + 0.617 (±0.404)	>0.999
Nicotinamide	Area = 1.336 (±0.010) x c + 1.662 (±0.181)	>0.999
Pyridoxine	Area = 1.005 (±0.011) x c + 0.263 (±0.141)	>0.999

**Table II**

Water-soluble vitamin content of DS and injectable solutions determined by the HPLC method

Vitamin	Declared concentration (mg/tablet)	Obtained concentration (mg/tablet)	Recovery (%)	Limits allowed (%)	Quality standard
Dietary supplement					
Thiamine	2	2.05	102.5	90-110	Checked
Riboflavin	1	1.071	107.1	90-110	Checked
Nicotinamide	1	0.995	99.5	90-110	Checked
Pyridoxine	0.5	0.45	90.6	90-110	Checked
Ascorbic acid	30	31.5	105.1	92.5-107.5	Checked
Injection solutions					
Vitamin	Declared concentration (mg/ml)	Obtained concentration (mg/ml)	Recovery (%)	Limits allowed (%)	Quality standard
Thiamine	50	50	100	95-105	Checked
Pyridoxine	25	23.9	95.6	95-105	Checked

## Discussion

### *The relevance of water-soluble vitamin intake*

The quality of DS is extremely important, and in the case of athletes it can make a difference not by excess (especially for water-soluble vitamins) but by subdosing; the intensity of energy processes is much higher in athletes, hence the daily requirement of these vitamins. It is known that the rate of basal metabolism depends on a number of factors such as gender, height, body surface, thyroid function, decreases with age and depends on the level of physical activity (Zemirli et al., 2018). Therefore, in the case of physical effort, the need for water-soluble vitamins

increases, as they are involved in catabolic processes of important energy substrates. Particular attention should be paid to endurance athletes who are exposed to high oxidative stress, vitamin and mineral supplementation being crucial (Brisswalter & Louis, 2014).

Thiamine in its active form, thiamine pyrophosphate (TPP), is involved in carbohydrate metabolism, so practically it is synonymous with energy production. TPP is part of the multienzymatic complex of *pyruvate dehydrogenase* involved in the oxidative decarboxylation of -ketoacids, therefore aerobic metabolism (aerobic glycolysis) is promoted by transforming pyruvate into acetyl-coenzyme A with a much better energy efficiency. A study on an additional 10 mg/kg body weight thiamine intake for 4 weeks showed a reduction in fatigue, lactate concentration and ammonium ions during aerobic exercise (bicycle, 60 minutes at 50 rpm) (Choi et al., 2013). A supplementary intake of thiamine during a carbohydrate rich diet is beneficial.

Pyridoxine in the form of pyridoxal phosphate (PLP) is a cofactor of over 100 enzymes, most of which are involved in the metabolism of amino acids (transamination, decarboxylation, deamination, etc.). Besides the amino acid catabolism processes, PLP is involved in the synthesis of important muscle peptides for sports performance, such as anserine and carnosine, and its influence in beta-alanine production is the limiting rate step in carnosine synthesis (Suidasari et al., 2016). Pyridoxine has an inhibitory effect on digestive enzymes involved in the metabolism of carbohydrates (*alpha-glucosidases, sucrase, maltase and glucoamylase*). Therefore, the administration of pyridoxine during a meal favors protein digestion and absorption of amino acids on the one hand, and prevents polysaccharide digestion and simple carbohydrate uptake on the other hand (Kim et al., 2018). Although pyridoxine is a water-soluble vitamin and therefore presents a low risk of accumulated toxicity, the literature presents the case of an 8-year-old child with chronic pyridoxine treatment for cerebral PLP dependent epilepsy, who developed hemophilia A following increased doses of pyridoxine with aging (Lheureux et al., 2005). Older studies show that PLP inhibits adenosine diphosphate (ADP)-induced platelet aggregation, therefore administration of higher doses to athletes to favor protein metabolism should be performed with caution, especially in sports where there is a risk of injury (Kornecki & Feinberg, 1980). Pyridoxine deficiency/overdose is associated with the occurrence of neuropathies by preventing transmission of the nervous impulse. Clinical manifestations of this pathology include: pain, muscle cramps, muscle weakness and tremor, all of which may affect performance. These modifications are reversible by optimizing vitamin intake (Chaudary et al., 2003). In high protein diets, the pyridoxine requirement is increased but remains within limits of 10 mg/day. Long-time treatment with high doses can cause neuropathy (also encountered in case of deficiency).

Niacin is converted into two coenzyme forms: NAD<sup>+</sup>/NADH, involved in energy metabolism by collecting hydrogen from different compounds and oxidation in the mitochondrial respiratory chain, and NADP<sup>+</sup>/NADPH, involved in reductive biosynthesis reactions in fatty

acids, nucleic acids, cholesterol metabolism (Chawla & Kvarnberg, 2014). According to the Framingham score, increases of LDL and decreases of HDL lipoprotein fraction are independent risk factors for coronary artery disease and, on the other hand, it is known that the risk of sudden cardiac death is higher for athletes than in the general population. Niacin is the oldest compound used to increase the HDL fraction of total cholesterol and reduce the fraction of LDL and serum triglycerides (O’Riordan et al., 2018). Niacin prevents lipolysis in the adipose tissue, therefore decreases the fraction of free fatty acids and plasma triglycerides and increases insulin sensitivity (Nelson et al., 2012), which leads to better use of carbohydrates as an energy substrate (Torrens et al., 2016). Niacin is degraded in the body by methylation, therefore excess niacin will deplete the reserves of methyl group donors such as betaine or methionine and, at the same time, there is a competition for methylation with catecholamines via *catechol ortho-methyl transferase* inducing noradrenaline plasma accumulation. Niacin fortification of grain in the US resulted, due to its chemical composition - starch (glucose source) and niacin, in increased insulin release, decreased glucose tolerance, and ultimately insulin resistance and at the same time obesity by increasing appetite (Zhou et al., 2015). Food fortification, especially with niacin, in order to reduce pelagic risk, resulted in daily doses of at least 33 mg niacin, a recommended dietary allowance (RDA) of 14-16 mg/day in adults being exceeded at least twice (Li et al., 2010).

The antioxidant effect of ascorbic acid is undeniable, and studies show that over 90% of vitamin DS contain ascorbic acid. Besides its antioxidant effect, ascorbic acid is involved in iron absorption, synthesis of collagen and catecholamines, all of these effects being important to athletes. With aging, muscle sensitivity to damage increases and recovery after exercise is much more difficult because the higher number of type 1 muscle fibers involves increased oxygen consumption and an increased rate of free radical production (Brisswalter & Louis, 2014). Ascorbic acid directly reacts with superoxide ion, and skeletal muscles in humans are extremely sensitive to ascorbic acid supplementation (Cobley et al., 2015). Although it has clear long-term beneficial effects on health, in the short-term, ascorbic acid can reduce sports performance by reducing muscle mitochondrial biosynthesis. Studies on experimental animals receiving ascorbic acid overdoses show a net reduction in athletic performance, but extrapolation of these data to the human species should take into account the fact that other animals, except humans, guinea pigs and monkeys, can synthesize ascorbic acid from glucose (Braakhuis, 2012). The chemical sensitivity of ascorbic acid, its conversion to dehydroascorbic acid, raises the issue of the quality of DS and, for analysts, of finding a method for extraction and determination of ascorbic acid in the reduced form (Spínola et al., 2014).

A rare deficiency in athletes who consume raw egg white (a myth imposed on athletes by the media) is biotin deficiency (avidin, a protein contained in raw egg white, links biotin in a non-absorbable form, heat treatment of eggs denatures biotin).

Oxidative stress directly correlated with physical

activity, lifestyle, environmental factors and diet is known to be involved in many acute and chronic diseases and is caused by changing the redox state of the cell through an imbalance between prooxidants and antioxidant defense. The level of physical activity directly influences this balance, paradoxically sedentariness as well as high intensity physical exercise favors the formation of reactive oxygen species (ROS), while during moderate intensity effort, exercise-induced redox adaptations of the cell are involved and ROS are degraded as they are formed (Pittaluga et al., 2006). During intense exercise, aerobic metabolism increases the flow of oxygen in the cell mitochondria, increasing it up to 200 times in the striated muscle and leading to ROS formation. The antioxidant defense of the body includes a number of enzymes (superoxide dismutase, catalase or peroxidase) as well as other substances such as glutathione and antioxidant vitamins such as fat-soluble vitamins A, E, D or omega 3 fatty acids (Garcia-Bailo et al., 2011) and water-soluble vitamins thiamine, riboflavin, niacin, pyridoxine, folic acid, cobalamin, pantothenic acid, biotin, and ascorbic acid which is the most important hydrophilic antioxidant in human plasma.

#### *Vitamin deficiency, types of anemia, consequences for athletes*

Anemia is frequently reported in performance athletes and it may have different causes. The diagnosis of anemia should be made with caution, athletes often having pseudoanemia (or athletic anemia), and refers to an insufficient number of red blood cells correlated with the intensity of effort. “Sports anemia” is usually encountered in vegetarian athletes - in this case anemia is caused by diet, or in endurance athletes - in this case it is caused by iron loss through intestinal hemorrhage, urine or intravascular hemolysis (due to dehydration) (Latunde-Dada, 2013). However, there are situations where anemia can be explained by vitamin deficiency. The vitamin B group has an important role in the synthesis of red blood cells. Vitamin B6 is involved in heme synthesis, PLP being the co-enzyme of *aminolevulinic acid synthase*, an enzyme catalyzing the limiting step in heme synthesis. Vitamin deficiency may contribute to sideroblastic anemia (Cazzola & Malcovati, 2015). Vitamins B<sub>12</sub> (cobalamin) and B<sub>9</sub> (folic acid) are erythrocyte maturation factors, vitamin deficiency causing megaloblastic anemia (Green, 2017).

Although the role of hemoglobin is well known, especially in aerobic sports, it is very difficult to determine how the ideal profile of the main hematological parameters should look like for athletes. Red blood cells are essential for the transport of oxygen from the lungs to tissues, but also contribute to maintaining optimal blood pH (7.4) as a component of the blood buffer system, to carrying carbon dioxide, binding protons H<sup>+</sup> and removing excess lactate released from the striated muscles during intense workout. Also, ATP and NO released from the red blood cells have vasodilator action, this action contributing to a better oxygenation of the tissues (Mairbäurl, 2013). An increase in hematocrit values has been observed especially in athletes practicing strength sports and less in those practicing endurance sports. This change in hematocrit

is associated with an increase in blood viscosity and is considered a cardiovascular risk factor. On the other hand, an increase in plasma homocysteine, another cardiovascular risk factor (homocysteine influences vascular endothelium and vascular muscle cells), was observed in the case of endurance athletes as a consequence of alteration of vascular structure and function (König et al., 2003; Herrmann et al., 2003; Ganguly & Alam, 2015). Hyperhomocysteinemia was negatively correlated with plasma levels of vitamin B<sub>12</sub>, ferritin and hemoglobin, hematological biomarkers of iron deficiency anemia (Sirdah et al., 2014). Since hyperhomocysteinemia may occur due to vitamin B<sub>6</sub> and B<sub>12</sub> deficiency, vitamin supplementation is effective in reducing plasma homocysteine levels and in reducing cardiovascular risk (Kumar et al., 2017).

#### *The quality of tested commercial products and regulatory issues*

Regarding the analytical experiment, in order to develop a simple, rapid and highly robust HPLC reversed-phase method for vitamin assay, structural issues were taken into consideration. The analyzed substances have structural heterogeneity with consequences on the dispersion of interaction with the stationary phase. The following physico-chemical properties were evaluated: the high hydrophilicity of ascorbic acid ( $\log P_{\text{octanol/water}} = -1.9$ ) and thiamine ( $\log P_{\text{octanol/water}} = -2.1$ ) in comparison with the other studied vitamins (riboflavin  $\log P_{\text{octanol/water}} = -1.46$ , pyridoxine  $\log P_{\text{octanol/water}} = -0.77$ , nicotinamide  $\log P_{\text{octanol/water}} = -0.37$ ) (Drug Bank, 2018); the differences of their acid-basic properties and molecular masses. The proposed reversed-phase HPLC method proved to be suitable for specific separation and quantification of five hydrosoluble vitamins in less than 8 minutes. The monitoring wavelength was selected taking into consideration the absorptivity of the analytes and a high specificity against any kind of interference from the samples. The presence of methanol as part of the organic modifier in the mobile phase finally allows the specific separation of seven vitamins. As it was demonstrated (Fig. 2), the method is specific against two other hydrosoluble vitamins, folic acid and cyanocobalamin, which were not quantified as they were not present in the studied products. However, the DS contains calcium pantothenate and three other lipophilic vitamins, A, D and E. Pantothenate does not have absorptivity at 260 nm and we were not able to quantify this substance with the proposed method on the same HPLC system with a single wavelength detector (Wang et al., 2004; Hudson & Allen, 1984). On the other hand, the lipophilic vitamins from DS were not extracted by the proposed hydrophilic extraction method. Thus, specificity against the other vitamins from the analyzed DS was guaranteed. The proposed analytical method had good linearity in the chosen concentration ranges. Regarding the quality of commercial products, both DS and medicinal products had the concentrations of the studied vitamins in agreement with Pharmacopoeia provisions (Table II) (\*\*\*, 2016).

The results confirmed that if the DS is a simple pharmaceutical “cocktail” of vitamins, quality could be easily verified by simple and valid analytical methods and

these products could obey drug regulations. However, it is difficult to achieve the same quality for all types of DSs as for medicinal products, especially for DS with natural complex ingredients. As it was previously mentioned, regulations in many countries are permissive. There is an international debate regarding the necessity for a real, constructive cooperation between scientists and regulators to harmonize at global level their approaches in order to guarantee both safety and efficacy of DSs (Dwyer et al., 2018). In this case, skepticism regarding the quality of DSs will be no longer realistic.

## Conclusions

1. Vitamin supplementation for performance athletes is justified by several reasons: vitamins (pyridoxine, thiamine, niacin) are involved in the catabolic processes of important energy substrates, have antioxidant properties (ascorbic acid), and are involved in the synthesis of red blood cells (pyridoxine, cobalamin, folic acid).
2. Most of the athletes use vitamin DS, but there is a risk that the products do not contain exactly the quantity declared by the manufacturer.
3. The tested products subjected to HPLC analysis contained the declared quantity of vitamins in agreement with the provisions of the European Pharmacopoeia.

## Conflict of interest

There are no conflicts of interest.

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## **Effects of a physiotherapy rehabilitation program on the quality of life in multiple sclerosis patients**

*Efecte ale tehnicilor de recuperare fizioterapeutică asupra calității vieții la pacienții cu scleroză multiplă*

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### **Abstract**

**Background.** Multiple sclerosis is an autoimmune, inflammatory disorder of the central nervous system that primarily affects the young adult. Characterized by a complex symptomatology, MS causes numerous physical and psychological disorders. Although many experimental studies confirm the usefulness of certain rehabilitation methods to reduce fatigue, pain and alleviate others symptoms, a complex and personalized protocol has not been practiced so far to ensure a significant improvement in the quality of life of people affected by MS.

**Aims.** The purpose of this study is to demonstrate that a supplementation of the conventional physiotherapy (PT) program with a personalized and complex PT intervention during one year will improve the overall quality of life of MS patients, and subsequently will optimize and increase the efficiency of the conventional PT protocol.

**Methods.** In addition to a conventional PT program, the experimental group also benefited from a personalized and complex PT intervention for three months, 2 sessions/week, and for 9 months, 2 sessions/month, aimed to improve the quality of life: breathing exercises, proprioceptive neuromuscular facilitation techniques, massage techniques, cervical tractions, manual lymphatic drainage. To assess the quality of life, the 36 Items Short Form Survey (SF-36) was used.

**Results.** After three months, the improvement of the quality of life was not significant ( $p = 0.077$ ), but it was at the end of the experiment, after 12 months ( $p = 0.031$ ). In the control group, the quality of life score had a slightly decreasing trend but not significant.

**Conclusions.** The results obtained by applying the complex PT program, on a regular and weekly basis, can be attributed to the improvement of the quality of life of MS patients who participated in the research study. Rehabilitation of MS patients requires a complex approach throughout their life.

**Keywords:** multiple sclerosis, combined kinetic techniques, quality of life

### **Rezumat**

**Premiză.** Scleroza multiplă (SM) este o boală autoimună, inflamatorie a sistemului nervos central, care afectează predominant adultul tânăr. Caracterizată printr-o simptomatologie complexă, SM produce numeroase suferințe la nivel fizic și psihologic. Cu toate că numeroase studii experimentale confirmă utilitatea anumitor metode de recuperare în vederea reducerii obosealii, durerii și ameliorării altor simptome, până în prezent nu s-a practicat un protocol complex și personalizat, care să asigure o ameliorare importantă a calității vieții persoanelor afectate de SM.

**Obiective.** Obiectivul acestui studiu este de a demonstra că o suplimentare a programului fizioterapeutic convențional cu o intervenție personalizată și complexă de tehnici în decurs de un an va îmbunătăți calitatea generală a vieții pacienților cu MS, va optimiza și va crește eficiența protocolului de recuperare convențional.

**Metode.** Grupul experimental a beneficiat în plus față de programul de fizioterapie convențional și de tehnici de armonizare holistică, timp de 3 luni, 2 sedințe/săptămână și timp de alte 9 luni, 2 sedințe/lună, constând din: exerciții de respirație, tehnici de facilitare neuroproprioceptivă, tehnici de masaj, decoaptări cervicale, drenaj limfatic manual. Pentru a evalua calitatea vieții, s-a utilizat "36 Items Short Form Survey (SF-36)".

**Rezultate.** Ameliorarea calității vieții la grupul experimental a fost semnificativă doar după 12 luni, la sfârșitul experimentului ( $p=0,031$ ), în schimb, grupul de control a înregistrat un ușor regres al scorului calității vieții.

**Concluzii.** Creșterea calității vieții la pacienții cu SM din grupul experimental se datorează suplimentării programului PT convențional cu programul de armonizare holistică.

**Cuvinte cheie:** scleroză multiplă, tehnici kinetice combinate, calitatea vieții

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Received: 2018, March 14; Accepted for publication: 2018, April 11

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<https://doi.org/10.26659/pm3.2018.19.2.98>

**Introduction**

Multiple sclerosis (MS), clinically described for the first time by Charcot (Sab u, 2006), is a complex, multifactorial, chronic autoimmune central nervous system disease characterized by inflammatory, demyelinating and gliosis processes (O’Sullivan et al., 2014), requiring an assessment by neurologists, psychiatrists, physiotherapists and other specialists of the multidisciplinary team (Frontera, 2010). Multimodal symptomatology is present depending upon the localization of lesions (Mo et, 2010), and includes sensory deficits, motor, cognitive and functional disorders, leading to limited participation in daily activities and restricted participation in social activities, drastically reducing the quality of life of the affected person (Burscha et al., 2014). The clinical manifestations of MS are: pyramidal, cerebellar, vestibular and mixed (Marcu & Dan, 2007). The highest prevalence of MS was recorded in the Orkney and Shetland Islands, 450 per 100,000 inhabitants, and the lowest prevalence of multiple sclerosis is reported in subequatorial areas, less than 5 persons per 100,000 inhabitants. The MS prevalence reported across our country is 25 per 100,000 inhabitants (Mihancea, 2011). Statistical data shows that the incidence of MS is 2-3 times higher in females, and the age of onset is between 15 and 50 years (Câmpeanu, 2007). In Romania, the cost of treatment for a patient with MS can rise up to 1200-1300 euros/month (1). In the USA, the treatment cost for a patient presenting with MS is also very high. According to the North American Research Committee on MS, the average annual cost for MS-affected patients who were treated with disease modifying agents reached \$ 47,215 (Jurc u, 2009).

The multitude of psycho-emotional disturbances and functional imbalances that drastically reduce the quality of life of people affected by MS and cause significant financial and socio-professional damage continues to stimulate researchers’ interest in finding optimal solutions both in relieving the symptoms of the disease and in reducing treatment costs. In our country, classical physiotherapy practice in most neurological rehabilitation centers addresses group and individual therapy. The reduced number of physiotherapists in these centers does not allow the individualization of the complex programs, which, besides the possibility of symptom relief, could reduce the high cost of treatment in MS patients.

By carefully analyzing the medical, social and financial context these people face, we considered appropriate to develop and implement a complex PT program to support the classical/traditional PT rehabilitation protocol in order to improve clinical symptomatology, to reduce the bouts, and stop disease progression. We believe that the techniques of the proposed PT program will have a measurable positive effect on the health status of subjects suffering from MS, compared to the classical PT program.

**Material and methods**

The University of Oradea Research Ethics Board approved this study.

*Research protocol*

a) *Period and place of the research*

The experimental study was conducted over a 12-month

period, from April 2016 to April 2017.

b) *Subjects and conduct of research*

A total of 82 patients with multiple sclerosis participated in the study. The study group included 43 patients from the Speromax Multiple Sclerosis Association, Alba-Iulia, out of which 18 men (41.86%) and 25 women (58.14%), with a mean age of 49.81 ± 8.72 years. The control group comprised 39 patients from the Day Care Center, Oradea, 15 men (33.33%) and 24 women (66.67%), with a mean age of 49.08 ± 9.38years (Table I).

**Table I**

Characteristics of both groups according to gender and age

Characteristics of the subjects	Experimental group n=43		Control group n=39	
	Female n=25	Male n=18	Female n=24	Male n=15
Gender (%)	58.14	41.86	66.67	33.33
Age (years)	49.81±8.72 years		49.08±9.38 years	

The inclusion criteria in the study were: confirmed MS diagnosis; written consent from patients and acceptance of the physician and the physiotherapist.

Both groups attended a classical physical therapy program with a physiotherapist, 3 times/week, for 12 months. A complex program aiming to harmonize and relax the whole body was added to the classical PT program of the experimental group, over a period of three months twice a week, and for another nine months twice a month. All patients were evaluated: at baseline, after three months and at the end of the experiment, after 12 months.

c) *Tests applied*

The 36-Item Short Form Health Survey (SF-36) was used to assess quality of life. It includes the concept of well-being and the perception of health. “The 36-Item Short Form Health Survey (SF-36). SF-36 is a set of generic, coherent, and easily administered quality-of-life measures. The RAND 36-Item Health Survey (Version 1.0) taps eight health concepts: physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions”(2).

*The PT program*

- The traditional therapeutic methods applied to both groups of patients included: PT, psychotherapy, massotherapy, assisted lymphatic drainage and occupational therapy.

- The complex PT program applied to the experimental group consisted of breathing exercises, proprioceptive neuromuscular facilitation techniques, myofascial massage, compressive tendon massage, plantar reflexology massage, cervical traction, manual lymphatic drainage. The session duration per patient was 30-45 minutes. The complex PT program comprised 1-2 sessions per week for the first 3 months, and 1-2 sessions per month for the next 9 months. The rehabilitation treatment was individualized.

d) *Statistical processing*

The calculation of treatment efficacy on the studied set of physical parameters was performed by applying the following algorithm for each parameter: a favorable evolution was noted with 1, a stationary evolution was

noted with 0, and an unfavorable evolution was noted with -1. For each step, a global score was calculated as the sum of the figures corresponding to the five parameters, as follows: the evolution over the first 3 months, the evolution over the next 9 months, the 12-month evolution. The score is between -5 (when all parameters have an unfavorable evolution) and +5 (when all parameters have a favorable evolution.) After calculating the score, this was divided by 9, the resulting percentage expressing the overall efficacy of treatment.

The statistical analysis was performed using EPIINFO, version 6.0, a program of the Center for Disease Control and Prevention in Atlanta and the WHO, adapted to medical statistics, and SPSS 19 processing. Parameter averages, frequency ranges, standard deviations, statistical significance using the Student method (t test) and  $\chi^2$  were calculated. The significance threshold was considered at  $p < 0.05$ .

## Results

Changes in quality of life scores in the experimental group

### a) Baseline to 3-month evaluation

Quality of life and physical and mental parameters increased after 3 months, but only in the mental field the difference was significant ( $p = 0.040$ ), as shown in Table II.

### b) Baseline to 12-month evaluation

After 12 months, all the scores were significantly improved (Table II).

Changes in quality of life scores in the experimental and control groups.

At baseline there was no difference between the results of the two groups.

### c) 3-month evaluation and 12-month evaluation

At 3 months and at the end of the experiment, all the scores of the experimental group increased compared to those of the control group.

## Discussions

The quality of life scores in the experimental group had an increasing trend over the three evaluations. Even though the extra PT program was very intensively applied in the first three months, the increase in the quality of life score was not significant after three months. The augmentation of the score became significant only at the end of the experiment, after 12 months.

Numerous studies have confirmed that regular physical activity improves health-related quality of life in patients with MS (Kerdoncuff et al., 2006). In a meta-analysis, Heine

et al. found in a total of 45 experimental trials, studying 69 exercise intervention programs in 2250 MS patients, a significant effect of physical activity, particularly in reducing severe fatigue (Heine et al., 2015). Another study at the University Hospital of Pisa (Italy) in 2014 revealed that the exercise program applied to a group of 17 MS patients, organized as a circuit, for 120 minutes/day during 5 days, had a positive impact on quality of life (Chisari et al., 2014). Another experimental study conducted at Indiana University-Purdue University Indianapolis on a sample of 292 subjects with MS diagnosis who performed a physical activity for 7 days confirmed a slight improvement in their quality of life (Motl et al., 2009). Exercise training had a positive impact on factors related to quality of life (Petajan et al., 1996). Our findings support physical activity as a possible modifiable behavior for mitigating reductions of QOL by improving self-efficacy in individuals with MS (Motl & Snook, 2008).

Taking into account all these findings, we consider that the increased score in quality of life was due to the physical activity intervention. Furthermore, the fact that the control group showed no improvement in their self-reported quality of life, even though they undertook the classical PT program, means that the supplementation of the PT program in the experimental group was critical in obtaining significant results. The improvement in the quality of life of the experimental group patients may also be attributed to the personalized way the complex techniques were applied.

There is a lot of evidence for the relaxing effect of massage and manual lymphatic drainage. The improvement of the individuals' personal health rating following massage treatments is a trend that is supported in the literature. In one study, after five weeks of massage treatments, MS patients displayed decreased anxiety, overall improved mood, a more positive opinion of the treatment management, better self-esteem, and improved body satisfaction (Hernandez-Reif et al., 1998). Another study also found a significant increase in MS patients' general health and well-being after six weeks of reflexology treatments (Mackereth et al., 2009). It is also possible that the improvements in health perception were due to the benefits of relaxation and stress relief. In another study, chronic pain patients displayed 36% decreased clinic visits after behavioral medical interventions were employed to promote relaxation and reduce stress (Caudill et al., 1991). As in many chronic illnesses, stress has been implicated in the aggravation of symptoms (Heesen et al., 2007). Thus, stress management in MS protects the body's ability to control inflammation

**Table II**

Quality of life scores in both groups, at baseline, after 3 months and at follow-up

Parameters	Experimental group			Control group		
	Baseline	After 3 months	After 12 months	Baseline	After 3 months	After 12 months
Quality of life	40.84±14.25	46.14±13.18	47.28±12.95 ( $p=0.031$ )*	38.29±6.86	38.10±7.30 $p=0.001$ **	36.05±8.02 $p<0.0001$ **
Physical	38.15±13.80	42.27±13.69	44.66±12.45 ( $p=0.024$ )*	37.40±6.23	37.09±6.60 ( $p=0.034$ )**	35.28±7.59 ( $p=0.0001$ )**
Mental	43.51±15.37	49.99±13.32 ( $p = 0.040$ )*	50.29±14.16 ( $p=0.036$ )*	39.17±8.73	39.10±9.07 ( $p=0.0001$ )**	36.82±8.95 ( $p=0.0001$ )**

\* P-values are shown for the differences in change over time in the experimental (same) group

\*\* P-values are shown for the differences between the scores of the experimental and control groups for the same assessment

and to better manage symptoms. Therefore, we consider that these two techniques had an important contribution to the mental and physical well-being improvement in the experimental group.

A short-duration combined respiratory muscle training program improved inspiratory and expiratory muscle strength, reduced fatigue in patients with mild to moderate MS, and contributed to maintaining emotional well-being and general health (Medical Outcomes Study 36-Item Short-Form Health Survey) (Ray et al., 2013).

Applied massage techniques, correlated with cervical traction, relax and harmonize the body to the deepest structures, giving both physical and emotional well-being, as well as a capacity to physically perform certain activities. The scores obtained from the interim and final evaluation of the quality of life items can confirm the efficacy of the new PT approach, as well as the importance of applying these techniques in a certain succession in order to achieve the proposed goal.

The “sine qua non” condition for increasing quality of life as well as for improving the overall symptomatology of people affected by MS is a complex and personalized approach to PT techniques.

Complex kinetic techniques have addressed the harmonization and relaxation of the whole body, as it is known that a physically balanced body provides increased effort and induces a state of emotional well-being and comfort.

The proposal of this new concept of complex kinetic techniques aims to find the optimal strategy for improving quality of life.

The succession of the applied techniques within the new complex concept is essential for the purpose of holistic harmonization of the body. The effort of a harmonious and relaxed body increases considerably.

## Conclusions

1. In the study group, after 12 months of treatment, there was an improvement in both the physical and mental range, while the control group showed a reduction in scores in both areas.

2. Physical impairment decreased in the study group and increased in the control group after 12 months of treatment, and physical fitness and general health increased in the study group and decreased in the control group.

3. A well systematized and sustained complex PT program improves the quality of life of patients with multiple sclerosis.

## Conflicts of interest

There were no conflicts of interest to declare.

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## Energy drinks for athlete students in university

*B uturi energizante pentru studen ii sportivi din universitate*

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### **Abstract**

*Background.* In recent years, the world has seen an increasing trend in the consumption of beverages called “energy drinks”, a non-scientific and non-medical marketing term for products marketed by beverage companies. These are usually beverages containing caffeine as well as other substances such as taurine, guarana, which claim to provide consumers with energy and vitality.

*Aims.* This study’s objective was to discover the pattern of consumption of energy drinks for athlete students who participate in the university sports associations of the regions of Bouira, Tizi Ouzou, Boumerdes, Bejaia, and their behaviors in the choice of these drinks.

*Methods.* A study sample included university athlete students from the faculties and institutes of the four state universities that are mentioned above: 32 athletes (20 males and 12 females) qualified for the inter-state championship. A questionnaire was distributed which included a set of questions based on two axes, and appropriate statistical tools were used to calculate the results (percentage,  $\chi^2$ ).

*Results.* Fake promotions and advertisements attract athletes to consume energy drinks. Information and wrong misconceptions can harm these students though the existence of health awareness for some students was noticed in the consumption of some brands.

*Conclusions.* The necessity to care for university athlete students and raise health awareness and the nutrition behavior for them.

**Keywords:** energy drinks, athlete students, university environment.

### **Rezumat**

*Premize.* În ultimii ani, lumea a văzut o tendință crescătoare în consumul de băuturi numite “băuturi energizante”, un termen comercial neștiințific și nemedical comercializat de companiile de băuturi, de obicei băuturi care conțin uzual cafeină, precum și alte substanțe, cum ar fi: taurina, guarana, pretinzând că oferă consumatorilor energie și vitalitate.

*Obiective.* Acest studiu urmărește cunoașterea modelului consumului de băuturi energizante al studenților sportivi din universități, activi în asociații sportive universitare pentru statele din Orientul Mijlociu (Bouira, Tizi Ouzou, Boumerdes, Bejaia) și cunoașterea culturii lor nutriționale, cu alte cuvinte comportamentele lor în alegerea băuturilor.

*Metode.* Am urmărit selectarea eșantionului de studiu într-un mod intenționat, care a inclus studenții sportivi universitari care sunt activi în asociațiile menționate mai sus. Sunt 32 de jucători de ambele sexe (20 de băieți și 12 femei) care au fost calificați la campionatul inter-state (zonal) după stabilirea calificărilor dintre facultățile și institutele celor patru universități de stat menționate mai sus. A fost distribuit un chestionar care a inclus un set de întrebări bazate pe două planuri și am folosit instrumentele statistice adecvate pentru a calcula rezultatele (procent,  $\chi^2$ ).

*Rezultate.* Promoțiile și anunțurile false îi atrag pe studenții sportivi să consume băuturi energizante. Existența unor informații și concepții greșite ale studenților sportivi este legată de aspectele de natură ale băuturilor energizante. S-a observat existența conștientizării privind sănătatea la unii studenți în consumarea unor băuturi.

*Concluzii.* Necesitatea de a avea grijă de studenții sportivi universitari de pretutindeni se poate realiza prin creșterea gradului de conștientizare privind sănătatea și comportamentele nutriționale.

**Cuvinte cheie:** băuturi energizante, studenți sportivi, mediul universitar.

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Received: 2018, March 6; Accepted for publication: 2018, March 30

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<https://doi.org/10.26659/pm3.2018.19.2.102>

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## Introduction

In 1977, the first brand mark for energy drinks emerged in the United States of America (3); thus, their industry flourished and spread until they reached more than 500 different trade brands in 2006 (2).

Energy drinks are marketed as they raise the level of mental and body activities (7), this product targets a category of youth between 18-35 years old, and the US Food and Drug Administration in its report issued in 2007 warned that some of the companies of energy drinks promote them as a legal alternative to drugs (5).

Energy drinks are considered a booming market, with steady increases in the sales all around the world (4). In addition, there are still many questions about their components and the possible health complications, in contrast to what the energy drink companies show (Worthley et al., 2010). Thus, these drinks do not provide the body with energy (Nelson et al., 2008), they contain substances that stimulate human nerves, as well as many other substances that cause stress, anxiety and inability to sleep (Bahaa El-Din, 1999).

For many years, we have heard and seen a set of advertisements that promote sports drinks calling them energy drinks (6); thus, many promoters present these products as substances that increase mental and physical abilities and specifically sexual ability for athletes and normal people in general.

Over the years, companies that work in the industry of sports drinks or energy drinks started to grow fast (Ragsdale et al., 2010). This may be due to the significant increase of demand for these drinks from civil societies that rely on technology that leads them to laziness and inactivity. Moreover, with the spread of satellite stations and the big number of special ads for these products, people became eager to buy energy drinks in order to compensate the lack of physical performance; this led to addiction to these drinks without being aware of it (\*\*\*, 1995).

After a lot of research, laboratories and field studies showed that these drinks have many dangerous effects on human health (Lamarine, 1994); thus, they lead to many diseases and sometimes to death (sudden death) (Abd al-Rahman al-Muzayqar, 1990). What is strange here is that companies manufacturing these drinks write their benefits on the label of the drink bottles and forget to mention their negative effects (Astorino & Roberson, 2010), keeping in mind that these benefits are fake and are not true in reality (1).

## Hypothesis

The pattern of consumption of different energy drinks in athlete students.

Promoting and advertising energy drinks increase the consumption of these drinks by athlete students.

Some information and beliefs that are related to the benefits of energy drinks for students increase their consumption.

## Material and methods

### Research protocol

This was aimed at knowing the pattern of consumption of energy drinks for athletes, as well as knowing their

nutrition culture, in other words their behaviors in choosing these drinks.

### a) Period and place of the research

The inter-state championship (regional) after setting the qualifications between the faculties and institutes of the four state universities for 2015-2016.

### b) Subjects and groups

The study included 32 sports players of both genders (20 males and 12 females) who were qualified for the inter-state championship (regional). The descriptive approach was used and the research sample was selected intentionally; it included the university athlete students participating in the associations of Bouira, Tizi Ouzou, Boumerdes, Bejaia. They were administered a questionnaire which comprised a set of questions divided into two axes.

### c) Tests applied

The title of the questionnaire: *The harmful effects of energy drinks are not fully understood and excess consumption may cause unwanted side effects.*

The administered questionnaire included a set of questions divided into two axes:

- demographics: (age, gender, residence, level of study, sport practiced)
- energy drink consumption:
  - 1) Do you presently consume energy drinks? Yes/No
  - 2) Have you ever consumed an energy drink? Yes/No
  - 3) Rank your reasons for using energy drinks: Sports/Activity/Power
  - 4) What influences your choice of energy drinks? Price/Popularity/Taste
  - 5) What type of energy drink do you mainly consume? Red Bull/Xs/Power Horse

### Statistical processing

We used the statistical package for social sciences IBM SPSS V25 to calculate search results:

- percentage (%)
- $\chi^2$  (chi-square).

## Results

The percentages and chi-square test for the axis statements are illustrated in Table I and Table II.

## Discussions

*Analysis and discussion of the results of the first axis (Table I)*

As the answers from the table above show:

- The answers to the first question evidence that 84.37% of the sample reported that they currently consumed energy drinks; however, 15.63% of them answered the opposite, and the chi-square test demonstrates these differences, the calculated value of  $\chi^2$  being 15.12, which is higher than the scheduled value (3.84), so that the differences are statistically significant.

- Concerning the second question, a proportion of 87.5% from the total sample answered that they had already taken energy drinks, whereas 12.5% reported the opposite, and the chi-square test emphasizes these differences in results, the calculated value of  $\chi^2$  being 28.8, higher than the scheduled value (3.84); thus, the differences in results are statistically significant.

- In the case of the third question, a percentage of 56.25% from the total sample answered that they took

**Table I**  
Percentages and chi-square test for the first axis statements

Distribution/ Questions	Suggestions	Repetitions	Percentage	Calculated value of (chi <sup>2</sup> )	Scheduled value of (chi <sup>2</sup> )	p
Question 1	Yes	27	84.37	15.12	3.84	<0.05
	No	05	15.63			
Question 2	Yes	28	87.5	28.8	3.84	<0.05
	No	04	12.5			
Question 3	Sports	06	18.75	8.4	5.99	<0.05
	Activity	18	56.25			
	Power	08	25			
Question 4	Price	08	25	12.2	5.99	<0.05
	Popularity	17	53.12			
	Taste	07	21.88			
Question 5	Red Bull	23	71.87	23	5.99	<0.05
	XS	04	12.5			
	Power Horse	05	15.63			

**Table II**  
Percentages and chi-square test for the second axis statements

Distribution/ Questions	Suggestions	Repetitions	Percentage	Calculated value of (chi <sup>2</sup> )	Scheduled value of (chi <sup>2</sup> )	p
Question 1	Yes	25	78.12	10.12	3.84	<0.05
	No	07	21.88			
Question 2	Yes	26	81.25	12.5	3.84	<0.05
	No	06	18.75			
Question 3	Yes	30	93.75	24.5	3.84	<0.05
	No	02	6.25			
Question 4	Yes	08	25	08	3.84	<0.05
	No	24	75			
Question 5	Yes	23	71.87	6.12	3.84	<0.05
	No	09	28.13			

energy drinks for the purpose of activity (stimulating), while a proportion of 25% took them for the purpose of power, and 18.75% took them for the purpose of practicing sports. The chi-square test emphasizes these differences in results, the calculated value of chi<sup>2</sup> being 8.4, which is higher than the scheduled value (5.99), so that the differences in results are statistically significant.

- Regarding the fourth question, a percentage of 53.12% from the total sample answered that the reason for taking energy drinks was popularity; however, 25% reported that the reason was the price, and 21.88% took them because of their taste. The chi-square test emphasizes these differences in results, the calculated value of chi<sup>2</sup> being 12.2, higher than the scheduled value (5.99), so that the differences in results are statistically significant.

- Concerning the fifth question, a proportion of 71.87% of the total sample answered that the energy drink they consumed was Red Bull and 15.63% Power Horse, while 12.5% indicated XS; the chi-square test emphasizes these differences in results, the calculated value of chi<sup>2</sup> being 23, which is higher than the scheduled value (5.99), so that the differences in results are statistically significant.

*Analysis and discussion of the results of the second axis (Table II)*

As the answers above show:

- The answers to the first question evidence that a proportion of 78.12% from the total sample reported that these drinks were the main source of energy, while 21.88% answered the opposite; the chi-square test emphasizes these differences in results, the calculated value of chi<sup>2</sup> being 10.12, higher than the scheduled value (3.84), so that these differences in results are statistically significant.

- The second question shows that 81.25% of the total sample answered that their feeling tired resulted from the fact that they did not take energy drinks, while 18.75% answered the opposite, and the chi-square test emphasizes these differences in results, the calculated value of chi<sup>2</sup> being 12.5, which is higher than the scheduled value (3.84), which means that the differences in results are statistically significant.

- Regarding the third question, 93.75% of the total sample believed that the increase in their activity and vitality during training was due to the consumption of energy drinks; however, 6.25% answered the opposite, and the chi-square test emphasizes these differences in results, the calculated value of chi<sup>2</sup> being 24.5, higher than the scheduled value (3.84), which means that these differences in results are statistically significant.

- Concerning the fourth question, 25% of the total sample considered that there were alternatives to energy drinks, while 75% thought so in case energy drinks were unavailable; there was no alternative to them. In addition, the chi-square test emphasizes these differences in results, the calculated value of chi<sup>2</sup> being 08, which is higher than the scheduled value (3.84), so that the differences in results are statistically significant.

- In the case of the fifth question, 71.87% of the total sample answered that the obtained positive athletic results were due to energy drink consumption, while 28.13% answered the opposite. The chi-square test emphasizes these differences in results, the calculated value of chi<sup>2</sup> being 6.12, which is higher than the scheduled value (3.84), which means that the differences in results are statistically significant.

## Conclusions

1. Promotion and misleading advertising increase the attractiveness of energy drink consumption to athletes.

2. The presence of some information and misconceptions about the benefits of energy drinks was seen among the students.

3. An increase in some students' awareness in consuming drinks was observed.

## Recommendations

1. Paying attention to studies that are concerned with athletes' behaviors towards the matters and products of nutrition.

2. Providing university sports clubs and teams with athletic nutrition specialists.

3. Paying attention to university athlete students and increasing their awareness about health and nutrition behaviors.

## Conflicts of interests

There are no conflicts of interest.

## Acknowledgments

The authors would like to thank all the persons involved in this study for their unconditional cooperation and support.

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## CASE STUDIES

# Bilateral Sertoli-Leydig cell tumor in a patient with complete androgen insensitivity syndrome: a case report and brief review of the literature

*Tumori bilaterale cu celule Sertoli-Leydig la o pacient cu sindrom de insensibilitate complet la androgen: un studiu de caz și o scurt revizuire a literaturii de specialitate*

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### Abstract

*Introduction.* Complete androgen insensitivity syndrome (46XY) with female phenotype is characterized by: well developed breasts, absent uterus and ovaries, short vagina, intra-abdominal testicles and also absent pubic and axillary hair. The cause is a mutation of the androgen receptor gene, located on the proximal long arm of the X chromosome (Xq11-120), which prevents the receptors and their ligands, including testosterone, to function properly.

*Case.* We report the case of a 40-year-old woman with primary amenorrhea and infertility problems who presented to the doctor after discovering two pelvic tumors. The diagnosis was complete androgen insensitivity syndrome with bilateral Sertoli-Leydig cell tumor and was based on the clinical features, histology exams and genetic result.

*Conclusions.* Intra-abdominal testes have a great risk of malignant transformation. Sertoli-Leydig cell tumors represent a rare entity, but being associated with the androgen insensitivity syndrome, they can appear in up to 80% of the cases. Genetic tests are of particular importance in sports selection and athletic performances in female athletes.

**Keywords:** androgen insensitivity syndrome, Sertoli-Leydig cells, infertility.

### Rezumat

*Introducere.* Sindromul de insensibilitate complet la androgeni (46XY) se caracterizează prin: sâni bine dezvoltate, uter și ovare absente, vaginul scurt, testiculele intraabdominale prezente și părul pubian și axilar absent. Cauza este o mutație a genei receptorilor de androgeni, localizată pe brațul lung proximal al cromozomului X-Xq11-12, care blochează receptorii la acțiunea hormonilor androgeni.

*Cazul.* Prezentăm cazul unei femei de 40 de ani cu amenoree primară și sterilitate, care se prezintă la medic pentru descoperirea unor formațiuni tumorale pelvine. Explorările clinice, histologice și rezultatele genetice au pus diagnosticul de tumoră bilaterală cu celule Sertoli-Leydig asociată sindromului de insensibilitate complet la androgeni.

*Concluzii.* Testiculele intraabdominale prezintă un risc crescut de malignizare. Tumorile cu celule Sertoli-Leydig reprezintă o entitate rară care, în asociere cu sindromul de insensibilitate complet la androgeni, se întâlnesc în până la 80% din cazuri. Testele genetice prezintă o importanță deosebită în selecția sportivilor și în evaluarea performanțelor sportive în cazul sportivelor.

**Cuvinte cheie:** sindrom de insensibilitate complet la androgeni, celule Sertoli-Leydig, infertilitate.

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Received: 2018, February 29; Accepted for publication: 2018, March 15

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<https://doi.org/10.26659/pm3.2018.19.2.106>

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## Introduction

Androgen insensitivity syndrome (AIS) or testicular feminization, named after the American gynecologist John Morris, is an X-linked recessive genetic condition. AIS leads to 46, XY, with the presence of a female phenotype: well developed breasts, absent uterus and ovaries, short vagina, bilateral undescended testes and also absent pubic and axillary hair (Sharma et al., 2012; Pizzo et al., 2013; Hughes et al., 2012). This can be caused by a mutation of the androgen receptor gene, located on the proximal long arm of the X chromosome - Xq11-12- which prevents the receptors and their ligands, including testosterone, to function properly (Ozülker et al., 2010).

AIS has 3 subcategories: complete (CAIS), mild (MAIS) and partial (PAIS) insensitivity; this classification describes the different levels of virilization (Farhud et al., 2016). The prevalence of AIS has been estimated to be one case in every 20,000 to 64,000 newborns for CAIS and it is unknown in the case of PAIS (Mendoza & Motos, 2013).

Diagnosis is made at puberty as primary amenorrhea must be present. AIS includes normal testicular development and an increased risk of malignant germ cell tumors, therefore early gonadectomy is recommended (Bel Hadj Youssef et al., 2008). Sertoli and Leydig cell tumors represent 1% of germ tumors and they are frequently associated with the testicular feminization syndrome (Fagouri et al., 2014).

We present a rare case of the association of bilateral Sertoli-Leydig cell tumors in a patient with CAIS.

## Hypothesis

We present the case of a 40-year-old woman with AIS and bilateral Sertoli-Leydig cell tumor as a model for postoperative management of treatment.

## Material and methods

The study was carried out according to current deontological laws, with the approval of the Ethics Committee of the Clinical Emergency Hospital Cluj-Napoca, after the patient gave her written informed consent.

### Research protocol

#### a) Period and place

In September 2017, the patient presented to the “Domic Stanca” Clinic of Obstetrics and Gynecology Cluj-Napoca after discovering a large pelvic tumor.

#### b) Subjects

Patient D.D., aged 40 years, first medical examination was 5 years before for primary amenorrhea, infertility problems and discovery of a large pelvic tumor. The patient described the absence of menarche, however she observed the first signs of puberty at the age of 11.

#### c) Tests applied

Clinical examination revealed female phenotype, with adequate development of sexual characteristics: normal breasts (Tanner IV), height 174 cm and weight 86 kg. The gynecological exam showed normal external genital organs and the absence of pubic hair (Tanner III), normal labia and clitoris, without hypertrophy, short blind vaginal pouch, absent cervix. At bimanual vaginal examination, a right sided mobile tumor, with a diameter of 10 cm, firm consistency, mildly sensitive, was palpable. The uterus and

ovaries were not palpable.

Ultrasound showed an irregular, large pelvic tumor of 10.5/7.7 cm, with parenchymal consistency; the uterus and ovaries were not visualized. For a better view, MRI was suggested.

MRI exam identified two pelvic tumors, a right latero-uterine mass of 10/10/9.9 cm (AP/CC/LL); in the left iliac region, a mass of 1.9/5.7/2.3 cm (AP, CC, LL); no signs of uterus and ovaries (Fig. 1).

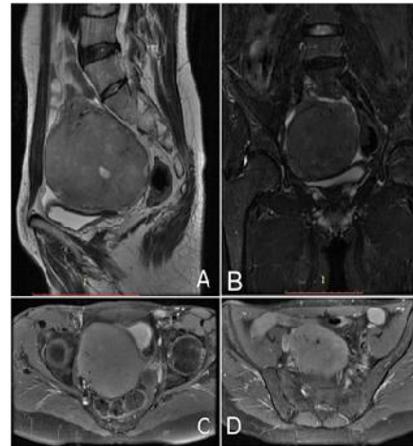


Fig. 1 – A and B - Sagittal and coronal T2W MRI scan of the abdomen and pelvis shows a tumor mass with a hypointense zone that corresponds to fibrous tissue; in the upper region there is a liquid capsule rich in flow voids that appear to be blood vessels. C and D - Axial T2W MRI scan shows a high uptake mass in the left iliac region, posterior to the psoas muscle.

During exploratory laparotomy, a midline fibrous tissue was seen at the insertion of the bilateral uterosacral ligaments. The uterus, bilateral fallopian tubes and cervix were absent. In the right iliac region, a 10/8 cm well-defined fibrous mass was found, in contact with the round ligament. Contralateral to this mass, an ovary-like connective tissue was present, without any specific structure.

The mass was extracted and sent to histology exam, which revealed either ovarian dysgerminoma with Sertoli and Leydig cell proliferation, or atrophic testes (pT2NxMxL1v0) (Fig. 2).

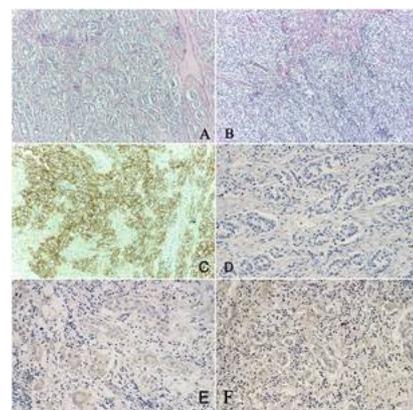


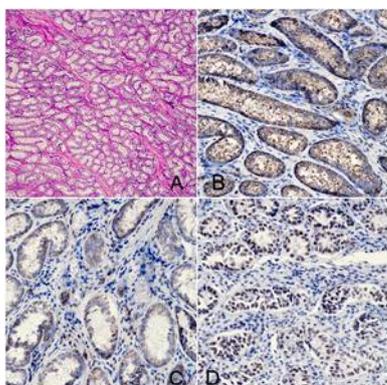
Fig. 2 – A - Hematoxylin-eosin (H & E) stain: the tubular pattern component of the tumor. B - H&E stain: nests of tumor cells separated by fibrous stroma with lymphocytes and giant cells. C - CD117 (c-Kit): strong membrane expression. D - CK7: negative. E - Alpha-fetoprotein (AFP): negative. F - CD30: negative - original magnifications X200 (A, B, C) and X400 (D, E, F).

During endovaginal *ultrasonographic exams*, a tumor in the left iliac region was found, which increased in size during a year, from 39/24 mm to 62/45 mm, and showed no signs of vascularization. As the patient had a history of Sertoli-Leydig cell tumor, another surgical intervention was advised. Laparotomy revealed an irregular mass 5x3 cm in size, with firm consistency, located in the left iliac region (Fig. 3).



**Fig. 3** – Gross image of the removed left gonad

Histology of the mass describes a well differentiated Sertoli-Leydig cell tumor (Meyer type I) (Fig. 4).



**Fig 4** – **A** - Hematoxylin-eosin stain shows a tubular pattern of cubic and cylindrical cells, with round, basal oriented nuclei and clear cytoplasm (Sertoli cells), intermingled with small nests of tumor cells with eosinophilic cytoplasm (Leydig cells). **B** - Inhibin stain highlights cytoplasmic positivity in both tumor cell populations (Sertoli cells and Leydig cells). **C** - Melan - A expression. **D** - WT-1 stain shows nuclear positivity in Sertoli cells - original magnifications X100 (A) and X400 (B, C, D).

A detailed clinical inspection and histology exams were followed by genetic testing which resulted in 46, XY.

Our diagnosis of complete androgen insensitivity syndrome with bilateral Sertoli-Leydig cell tumor was based on the clinical features, histology exams and genetic result.

## Discussion

Sexual differentiation is a complex mechanism and is compound of the following major elements: chromosomes

and genes, gonads, hormonal profile, anatomy and psyche. Chromosomal and genetic sex is determined in the first seconds of life, and is essential for the development of the next levels. At the time of fertilization, two *haploid* chromosomal sets fuse, each of them containing 22 autosomal chromosomes and 1 heterosomal chromosome, and form a *diploid* cell, either 46, XY (male), or 46, XX (female). The Y chromosome has a sex determining region (SRY - sex determining region of Y), which plays a major role in testicular formation and differentiation. In the absence of this gene, the presence of testes is improbable and feminine gonads appear. By the 9th week of male development, Leydig cells are formed and start to produce testosterone, responsible for male phenotype and characteristics; Sertoli cells secrete anti-Mullerian factor which prevents the development of Mullerian ducts into female genital organs: uterus, fallopian tubes and upper part of the vagina (Sadler, 2010).

In the absence of testosterone, the male phenotype is compromised; however, the presence of the anti-Mullerian factor inhibits the internal female genital organs to form, causing testicular feminization. Altered testosterone action can appear in different situations. On the proximal long arm of X chromosome (locus Xq11-Xq12), there is a gene responsible for specific nuclear androgen receptor, which is essential for the hormone's intracellular action. Mutation or absence of this gene causes malfunction of androgen receptors and prevents testosterone to act on peripheral cells. In 1989, Lubahn et al. (Lubahn et al., 1989) isolated the 8 exons of the AR (autosomal recessive) gene, located on the X chromosome, and also its mutation resulting in testicular feminization. This condition was first reported by John Morris (1853) (Galani et al., 2008).

In sports competitions, the presence of pseudohermaphrodites violates the principles of biological equality. Intersexuals benefit from androgen hormones, which are responsible for more developed muscle mass and mental balance. Here we include women with pure dysgeusia, such as AIS, and women with hypoplastic ovaries, normal karyotype and primary amenorrhea. These, despite having no additional sources of androgens, are taller and have longer legs (Dragan et al., 1982).

In 1966, tests for female eligibility were introduced. These tests were based solely on physical examination. Since the 2000 Summer Olympics, questioned sex and gender has been evaluated on a case-by-case basis by a team of specialists in endocrinology, genetics, gynecology and psychology (Ballantyne et al., 2012).

Endogenous androgenic hormones in the circulation of elite female athletes with disorders of sex development give them a competitive advantage. In the case of CAIS, a high testosterone level would be of no significance. The genetic component in the case of sex segregation in sports seems largely provided by the Y chromosome. Tallness, whether determined by genes on the Y or any chromosome, offers an example of an acceptable variable that contributes to athletic success in elite female athletes, including those with 46 XY (Ferguson-Smith & Bavington, 2014).

Talking about equality, in events where androgenization provides a powerful advantage, women competing against women with a degree of hyperandrogenism that gives

them a male physiology are likely to be at a disadvantage tantamount to competing in the male category. For this reason, women with AIS and hyperandrogenism have two options of treatment to stop virilization: hormonal suppression of androgens (estrogen-containing oral contraceptives) or surgical removal of the source of androgens.

The policies about eligibility of females with hyperandrogenism have been criticized by some. For eligibility purposes, no female athlete is forced to undergo gonadectomy.

Particular attention should be paid to how assessments are initiated to protect athletes from stigma. Informed consent, privacy and psychological support all along the process and during the first years of treatment are of critical importance (Bermon et al., 2015).

AIS can be classified into 3 subgroups, each of them describing a different level of virilization: CAIS (complete AIS); PAIS (partial AIS); MAIS (mild AIS). According to Qigley et al. (1995), CAIS represents a normal female phenotype with the absence of pubic and axillary hair; PAIS is a combination of female and male characteristics, and MAIS can be described as a normal male phenotype, with infertility due to azoospermia and reduced virilization.

Our patient showed clinical features characteristic of CAIS, with the absence of pubic and axillary hair, well represented feminine adipose tissue and breasts. Female external genital organs were present but the labia majora was underdeveloped. Internal female genital organs were absent, with total absence of the uterus and presence of two tumor masses in the pelvis. As total absence of the uterus was first discovered by imaging techniques (US/MRI) and later by exploratory laparoscopy, hormonal assessment of primary amenorrhea was not performed. The first diagnosis was Mayer-Rokitansky-Kuster-Hauser syndrome; however, MRI showed an irregular tumor with unusual structure in the right side of the pelvis, with increased dimensions compared to a normal ovary. Clinical examination showed sensitivity in the lower abdomen, therefore extraction and histological examination of the right lateral mass was recommended. Histological findings showed either an ovarian dysgerminoma with the proliferation of Sertoli and Leydig cells, or atrophic testes. Ovarian Sertoli-Leydig cell tumors are considered rare conditions which appear in women aged 20-30 years and represent less than 0.5% of all ovarian neoplasms (Melero Cortés et al., 2017). CAIS patients have a 5-10% higher risk of developing germ cell tumors, neoplasms being uncommon. Sertoli-Leydig cell tumors are usually benign in this category of patients. Also, well differentiated Sertoli-Leydig cell tumors are associated with CAIS in 10% of the cases. In CAIS, malignant evolution of remnant testes is imminent and has a 5-10% risk in the first 25 years, which can increase up to 33% at the age of 50 (Fagouri et al., 2014). According to these findings and histological results, the left sided tumor mass was also extracted and analyzed, to prevent its possible malignant transformation. The second histopathological diagnosis showed a well differentiated Sertoli-Leydig cell tumor. The association of the Mayer-Rokitansky-Kuster-Hauser syndrome with the rare Sertoli-Leydig cell tumors was highly improbable, therefore

chromosomal testing for CAIS was recommended, which showed 46, XY. Chromosomal testing along with imaging, histological and clinical findings confirmed the diagnosis of CAIS. Mutation analysis of our patient's and her family's genome could provide the final diagnosis of the AIS type, but we should consider some psychological and social aspects before revealing our results to the patient. She is now a 40-year-old woman, married, who wants children and has difficulties accepting the fact that without uterus this is impossible, and this information could also affect her interpersonal relationship with her husband. We also analyzed the family history, which evidenced no signs of infertility or intersexuality problems, but this cannot exclude the presence of the recessive mutation in the genome of other female relatives. This ethical dilemma implies multidisciplinary cooperation.

## Conclusions

1. AIS is a rare condition, caused by the resistance of peripheral tissues to androgens.
2. Female athletes with hyperandrogenism do not possess any physical attribute relevant to athletic performance that is neither attainable, nor present in other women.
3. Sertoli-Leydig cell tumors represent a rare entity, but being associated with testicular feminization, they can appear in up to 80% of the cases. Treatment is composed of prophylactic bilateral gonadectomy and hormonal substitution for the proper development of secondary genital characteristics.
4. Genetic tests are of particular importance in sports selection and athletic performances in female athletes.

## Conflicts of interests

Nothing to declare.

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## REVIEWS

# Diagnosis and treatment aspects of surgical pathology in athletes

*Patologia chirurgicală la sportivi - aspecte diagnostice și terapeutice*

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### Abstract

Surgical pathology in athletes is an important chapter of modern surgery, and in many cases it also has a high degree of difficulty in terms of a positive diagnosis. Whether chronic or acute, the diagnosis for inguinal pain should be made as early as possible to reduce as much as possible the period during which the athlete is absent from training and competitions, thus speeding up the athlete's comeback. Moreover, the treatment algorithm in these cases must be chosen correctly, the differential diagnosis thus gaining special importance. One should keep in mind that if wrongly diagnosed and treated, this pathology can lead to a premature termination of the athlete's career. On the other hand, the late return of the athlete to the characteristic activity of the chosen sport can have an important economic impact on the club or organization where the athlete is active.

**Keywords:** pain, surgical pathology, athletes

### Rezumat

Patologia chirurgicală la sportivi reprezintă un capitol important al chirurgiei moderne, având totodată, în multe cazuri, un grad de dificultate crescut în ceea ce privește diagnosticul pozitiv. Fie că vorbim despre durerea inghinală cronică sau acută, stabilirea diagnosticului trebuie făcută cât mai timpuriu, pentru a reduce cât mai mult posibil perioada în care sportivul lipsește de la antrenamente și de la competiții, grăbind astfel reinseria sportivă a atletului. De asemenea, algoritmul de tratament în aceste cazuri trebuie să fie corect ales, diagnosticul diferențial căpătând astfel o importanță deosebită. Această patologie, încorect diagnosticată și tratată, poate conduce la încheierea prematură a carierei sportivului. Pe de altă parte, întoarcerea tardivă a sportivului la activitatea caracteristică sportului ales poate avea un impact economic important din partea clubului sau organizației la care sportivul activează.

**Cuvinte cheie:** durere, patologie chirurgicală, sportivi

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## Chronic groin pain

Inguinal pain is the most common symptom in athletes, occurring in up to 6% of all lesions directly related to performance sports (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004; Szolga & Alexescu, 2017). In sports medicine terminology, there are several terms to define this pathological condition, including: “sports hernia”, “Gilmore's groin”, “athletic pubalgia”, “pubic inguinal pain syndrome”, “incipient hernia”, or the newer “inguinal disruption” following the consensus meeting in Manchester (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004). Chronic groin pain occurs especially in sports involving rapid acceleration or deceleration, torsion, sudden changes in direction, movements that are

encountered in football, rugby, hockey, Australian football, long-distance running (Anderson et al., 2001; Fon & Spence, 2000).

### a) Inguinal hernia

One of the most common causes of chronic groin pain in athletes is inguinal hernia, which according to some authors is present in up to 50% of chronic groin pain with a history of over eight weeks (Kluin et al., 2004).

### - Definition

Gilmore's groin, also referred to as “sports hernia” is defined as the presence of chronic pain in the inguinal region without the palpation of an inguinal tumor. At the objective exam, during the cough effort intensity assessment, this tumor formation is not always palpable (Kluin et al., 2004; Campanelli, 2010). Other authors

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Received: 2018, April 2; Accepted for publication: 2018, April 20

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<https://doi.org/10.26659/pm3.2018.19.2.111>

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define sports hernia as the presence of a weakness of the posterior wall of the inguinal canal, without the presence of a clinically identifiable hernia (Anderson et al., 2001; Fon & Spence, 2000).

- *Clinical diagnosis*

Clinical diagnosis is based on medical history and a carefully performed physical examination. Symptomatically, the condition occurs as chronic unilateral groin pain or pain in the pubic tubercle, which exacerbates during physical effort and disappears when this stops. Sometimes, the pain only occurs right after the physical activity is over. What is universally accepted is that groin pain reappears when the athlete resumes physical activity and, as a consequence, athletic performance gradually decreases. Groin pain sometimes radiates into the scrotum, the root of the thigh, or the pubic tubercle. Initially, pain occurs after physical effort, then it becomes so strong that the athlete can no longer practice that sport (Anderson et al., 2001; Fon & Spence 2000; Kluin et al., 2004).

Clinical examination should be carefully performed, highlighting possible inguinal tumor masses that would facilitate diagnosis. The palpation of the pubic tubercle, the conjoint tendon, the origin of the adductor longus muscle, the pyramidal muscle and the right abdominal wall muscle is also necessary, which sometimes causes pain (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004). When performing taxis maneuver, a dilated superficial inguinal ring or a weakening of the posterior inguinal wall can be evidenced, but the tumor mass typical for inguinal herniation is not evidenced, not even when the Valsalva maneuver is performed by the patient (Anderson et al., 2001).

Some authors believe that the existence of three of the following clinical signs can guide diagnosis towards sports hernia:

- a) Pain with palpation, located immediately above the pubic tubercle, at the insertion site of the conjoint tendon.
- b) Pain with palpation of the deep inguinal ring.
- c) Pain or dilation of the superficial inguinal ring, without a palpable tumor in this region.
- d) Pain in the origin tendon of the adductor longus muscle.
- e) Diffuse groin pain that radiates into the root of the thigh, the perineum or the median line (Anderson et al., 2001).

- *Differential diagnosis*

Diagnosing Gilmore's groin is a difficult task, mainly due to the presence of a small inguinal hernia, which in most cases cannot be clinically identified, requiring paraclinical imaging exams. There are a number of other conditions that help make the differential diagnosis. Thus, among orthopedic disorders, the following should be mentioned: muscular disorders (stretching or rupture of the adductor longus muscle, the right abdominal muscle or the iliopsoas), degenerative or traumatic diseases of the coxofemoral joint, osteitis pubis or athletic pubalgia, stress fracture (pubic ramus fracture or femoral neck fractures), impairment of the ilioinguinal or genitofemoral nerves. Genitourinary disorders include: prostatitis, epididymitis, hydrocele, varicocele, urinary tract infections. Certain gynecological disorders such as endometriosis or dysmenorrhea should

also be mentioned. Last but not least, differential diagnosis is based on intestinal conditions: diverticulitis, irritable bowel syndrome, chronic appendicitis or postoperative adherence syndrome (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004; Campanelli, 2010).

- *Paraclinical diagnosis / diagnostic imaging*

From a clinical point of view, diagnosing Gilmore's groin is extremely difficult. As such, paraclinical imaging examinations are required. To establish the diagnosis of inguinal hernia, inguinal ultrasound, in particular dynamic ultrasound of the groin, is necessary and sometimes sufficient. With the 5MHz transducer located at the inguinal level, the patient is asked to perform the Valsalva maneuver in order to visualize a small inguinal hernia, as well as to calculate the size of parietal impairment (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004). Herniography has also been described, which is an invasive imaging technique (after puncture of the linea alba caudal to the umbilicus, water soluble low osmolar contrast medium is injected into the peritoneal cavity, after which the patient is required to perform the Valsalva maneuver). Fluoroscopy is considered positive if contrast extravasation is observed outside the peritoneal cavity (Anderson et al., 2001). The complication rate associated with this invasive maneuver is somewhere between 3-6%, therefore its use is questionable (Anderson et al., 2001).

Nuclear magnetic resonance (NMR) is used not only to diagnose inguinal hernia, but also to exclude other associated pathologies, or to help establish the differential diagnosis (bone marrow edema, fluid in the symphysis pubis joint, osteitis pubis, tendon rupture of the adductor longus muscle or the abdominal muscle) (Anderson et al., 2001; Fon & Spence, 2000). Radiography may also be useful in excluding other pathologies (degenerative lesions or fractures in the coxofemoral joint, the sacroiliac joint or the spine). Changes in osteitis pubis can be highlighted on X-rays, such as periosteal changes at this level, sclerosis or increased space between the two symphyses (Anderson et al., 2001).

- *Treatment / reintegration*

*Conservative treatment*

The literature suggests that symptoms of inguinal pain are rarely significantly relieved by conservative treatment alone. The treatment algorithm in these cases, however, involves the use of conservative treatment, but only for a period of 6-8 weeks. If there is no improvement in the described symptomatology, surgical resolution is indicated (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004; Campanelli, 2010; Swan & Wolcott, 2007). Conservative treatment involves rest, nonsteroidal anti-inflammatory drugs, physiotherapy, local ice application, electrical stimulation, massage, injectable corticosteroids (Anderson et al., 2001). Under this treatment, the patient is gradually allowed to exercise, and after 10-12 weeks, if he/she does not accuse pain, he/she can return to performance sports (Biedert et al., 2003; Dimitrakopoulou & Ernest, 2016).

*Surgical treatment*

As stated in the conservative treatment subchapter, surgical treatment should be considered if there is no improvement in symptomatology after 6-8 weeks of

conservative treatment (Caudill, 2008; Joesting, 2002; Van Der Donckt et al., 2003; Farber & Wilckens, 2007; Ekstrand & Ringborg, 2001).

Regarding the chosen surgical procedure (open or laparoscopic), there are many discussions at the moment, with advantages and disadvantages for each chosen approach.

The laparoscopic approach is preferred by many surgeons due to its advantages: a minimally invasive procedure, the short length of hospitalization, faster reintegration into sports activities, the possibility to visualize and dissect the contralateral inguinal region. The laparoscopic approach may be totally extraperitoneal (TEP), or transabdominal pre-peritoneal (TAPP) (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004; Campanelli, 2010), using prosthetic materials in 100% of cases, compared to only 35% in the case of conventional approaches (Caudill et al., 2008). The reintegration rate following laparoscopy is 1-3 months, compared to 3-6 months in the case of conventional techniques (Dimitrakopoulou & Ernest, 2016). Also, the success rate of laparoscopic techniques is 95% on average (Kluin et al., 2004; Genitsaris et al., 2004; vanVeen et al., 2007). However, some authors report a relapse rate of 10.1% after laparoscopic approach, compared to only 4.9% after conventional approach, mainly due to the fact that the visual field is smaller than with open surgery (Joesting, 2002). Thus, in a previous conventional approach (Bassini, Shouldice, Lichtenstein), the following could be visualized: the aponeurosis of the external oblique abdominal muscles, the pubic origin of the right abdominal muscle, the conjoint tendon or possible damage to the ilioinguinal nerves or the genital ramus of the genitofemoral nerve (Campanelli, 2010; Sheen & Iqbal, 2014; Anderson et al., 2001; Fon & Spence, 2000).

In a study by Ekstrand and Hilding on more than 300 professional football players, the authors concluded that most patients had at least two causes of inguinal pain (Anderson et al., 2001; Fon & Spence, 2000).

Moreover, the success rate of the previous approach is comparable to the laparoscopic one, with no statistically significant differences (Caudill et al., 2008).

On the other hand, the question is whether the contralateral inguinal region should also be treated surgically, even if it is asymptomatic. However, the question remains unanswered. On the one hand, only 5% of surgeons operate the contralateral inguinal region preventively (Steel et al., 2004) and, on the other hand, only 10% of the athletes undergoing surgery on one side later accuse pain in the contralateral inguinal region (Steel et al., 2004). Future prospective randomized studies are needed to compare the two surgical techniques (open vs. laparoscopic), to study the efficacy of prosthetic materials, and thus determine the real effectiveness of each method (Dimitrakopoulou & Ernest, 2016).

#### *b) Chronic pubalgia*

##### *- Definition*

Chronic pubalgia is a non-infectious inflammatory disease that affects the pubic symphysis as well as the adjacent structures. It is mainly correlated with sports involving repeated kicking (football, rugby) and running with sudden change of direction (Anderson et al., 2001;

Fon & Spence 2000). The term chronic pubalgia is similar to that of osteitis pubis, especially if it is closely related to performance sports (vanVeen et al., 2007). The pathophysiological mechanism is overloading of the abdominal muscles, thigh flexors and adductor muscles, especially when suddenly changing direction while running (Kluin et al., 2004).

##### *- Symptoms*

The main symptom encountered in these cases is pain in the pubic region. Pain can radiate into the abdomen, perineum and adductor muscles of the thigh, accentuating during physical effort, especially during sudden changes of direction. The evolution of the disorder involves poorer performance in sport, and later pain during everyday effort (Paul et al., 2002; Dantas de Queiroz et al., 2014).

##### *- Diagnosis*

The diagnosis is established based on careful examination and paraclinical medical imaging. The forced abduction test must be performed during physical examination (Dantas de Queiroz et al., 2014). With the patient in supine position and the lower limbs partially bent and abducted, a forced abduction movement is applied. The examiner's palms are opposed to this forced abduction movement, when pain in the pubic region occurs.

Paraclinical medical imaging includes pelvic radiography and nuclear magnetic resonance. When performing pelvic radiography, the following pathological aspects can be highlighted: abnormalities in the pubic symphysis, narrowing of the space between the two symphyses, bone reabsorption at this level (osteoporosis), small bone fractures (avulsion fracture), sacroiliac joint alterations, or signs of osteoarthritis (bone sclerosis, subchondral cysts or osteophytosis). Nuclear magnetic resonance also helps visualize the presence of bone marrow edema (Dantas de Queiroz et al., 2014).

Differential diagnosis should be based on a series of other conditions, as follows: non-infectious causes mainly associated with urological maneuvers, infectious causes located at this level, degenerative or rheumatic diseases (Dantas de Queiroz et al., 2014). Positive diagnosis should be established as soon as possible, the athlete's reintegration into sports activity being directly proportional to the time elapsed from the first symptom to diagnosis (Batt et al., 1995; Dantas de Queiroz et al., 2014).

##### *- Treatment*

For the treatment of athletic pubalgia, most authors initially recommend conservative treatment consisting of: physical rest, physiotherapy, analgesics, nonsteroidal anti-inflammatory drugs, or corticosteroid infiltrations (Moldovanu & Pavy, 2014). Corticosteroid infiltrations are indicated when there is no response to anti-inflammatory therapy, physiotherapy, rest. At this point, corticosteroid infiltration results are controversial, with studies proving a positive response (Fricker et al., 1991), while other studies show a minimal positive effect (Batt et al., 1995).

Surgical treatment is only indicated when conservative treatment has failed. Here are some of the techniques employed for the surgical resolution of athletic pubalgia: bridging (or fusion) of the pubic symphysis, anterior resection, trapezoidal resection or even pubic symphysis curettage (Anderson et al., 2001; Fon & Spence, 2000).

Pubic symphysis fusion has the advantage of avoiding posterior articular instability occurring after anterior resections, but it also has drawbacks: longer duration of surgery, more difficult recovery, or complications associated with internal fixation (Anderson et al., 2001).

### Acute pain in the inguinal region

The mechanisms that determine the occurrence of inguinal injuries are direct trauma, strong contraction, or chronic, repetitive microtraumas. These result in contractions, muscle tension, ruptures or avulsion. Acute lesions are divided into muscle, bone and joint lesions (Polglase et al., 1991). In this subchapter we will only insist on acute muscular lesions, namely muscle contusions and ruptures.

#### *Muscular lesions*

##### *- Muscle contusions*

Muscle contusions occur especially in contact sports, where there is little protection (football, rugby). The mechanism that produces these lesions is in most cases direct trauma, which leads to compression of the musculature on the bone (Polglase et al., 1991). Muscle contusions occur more frequently in the external and internal skeletal muscles, as well as at the upper third of the thigh (McSweeney, 2012). The diagnosis of these lesions is based on physical examination, in conjunction with soft tissue ultrasound and/or nuclear magnetic resonance (with the possibility of highlighting the hematoma from the muscle body) (McSweeney et al., 2012). If the trauma is strong and the affected musculature is well-developed (such as the quadriceps) complications such as myonecrosis or myositis ossificans may occur (Polglase et al., 1991).

##### *- Muscle rupture*

Muscle ruptures are the most common injuries in the groin and thigh in sports competitions, occurring more frequently in the muscles that cross two joints. The classification of these lesions is as follows: grade 1 - no functional impotence; grade 2 - moderate functional impotence, and grade 3 - total muscle rupture with total functional impotence (Anderson et al., 2001; Fon & Spence, 2000). Ultrasound and/or nuclear magnetic resonance detect for grade 1 - minimal lesions, characterized by the presence of a small hematoma in the muscle body, or the presence of a small amount of perifascial fluid; for grade 2 - muscle rupture, which is not total, in addition to the presence of muscular hematoma; for grade 3 - complete muscle rupture with retraction of the muscle ends (Shelly et al., 2009; Davies et al., 2010; Marshall & Koulouris, 2009). Nuclear magnetic resonance is especially preferred for athletes with well-developed muscles, where sometimes the thickness of the musculature represents a limitation for ultrasound (Ekstrand & Hilding, 1999). There is a directly proportional relationship between the rehabilitation time and the percentage of impaired muscles in cross section (NMR) (Ekstrand & Hilding, 1999).

#### *Treatment of muscle lesions*

Several types of treatment have been used for muscle damage, aimed at accelerating the regeneration of muscle fibers. These include physical rest, which may range from relative to total rest, pain relievers, nonsteroidal anti-inflammatory drugs, corticosteroids, angiotensin II

receptor blockers, insulin-like growth factor (IGF), as well as alternative treatments such as ultrasound, cryotherapy, massage, or hyperbaric oxygen therapy (Anderson et al., 2001; Fon & Spence, 2000).

### Conclusions

1. The most common surgical symptom in athletes is represented by inguinal pain, and one of the most common causes of chronic groin pain is inguinal hernia.
2. Differential diagnosis of chronic groin pain is a difficult task, sometimes due to the presence of a small inguinal hernia, which in most cases cannot be clinically identified.
3. Laparoscopic repair of sports hernia represents an effective approach, and has the advantage of bilateral groin dissection and identification of occult hernias.

### Conflicts of interests

The authors declare no conflict of interest.

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# Adventure education, a method to prevent antisocial behavior

*Educa ia prin aventur , o metod de prevenire a comportamentelor antisociale*

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## **Abstract**

Antisocial behavior seems to be influenced by low self-esteem and caused by a person's inability to adapt to a social situation. This inability to adapt is caused by a lack of social skills, also named interpersonal skills. Adventure education is a form of education aimed at developing intrapersonal and interpersonal skills, and research shows that this form of education has proven successful at developing skills such as communication, teamwork, leadership and the self-concept. Studies performed on the use of adventure education in therapy have shown that it can change the attitude of problematic students and stop recidivism. Adventure education could prove to be the tool needed in order to prevent the development of antisocial behavior in the new generations.

**Keywords:** adventure education, antisocial behavior

## **Rezumat**

Comportamentele antisociale par a fi influențate de o stim de sine scăzută și cauzate de inabilitatea unei persoane de a se adapta unei situații sociale. Această inabilitate de a se adapta este cauzată de lipsa unor deprinderi sociale, numite și interpersonale. Educația prin aventură este o formă de educație care urmărește dezvoltarea deprinderilor intrapersonale și interpersonale, iar cercetarea a arătat că această formă de educație a reușit să dezvolte deprinderi de comunicare, lucru în echipă, leadership precum și conceptul de sine. Studiile privind utilizarea educației prin aventură în terapie au arătat că aceasta poate schimba atitudinea elevilor problematici și poate stopa recidivismul. Educația prin aventură ar putea fi instrumentul necesar pentru a preveni dezvoltarea comportamentelor antisociale la noua generație.

**Cuvinte cheie:** educația prin aventură, comportament antisocial

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## **Introduction**

There seems to be an increase of antisocial behavior among Romanian teenagers in recent years and schools find it difficult to find solutions other than punishing offenders. If we are to grow and develop as a country, we need a long-term solution, and adventure education could be it. This form of education has existed for some time now in the world and has been implemented in schools with what seem to be successful results in the development of various skills and the prevention or correction of antisocial behavior. This article highlights in brief the reasons why adventure education could be the solution to the prevention of antisocial behavior in teenagers.

## **What is Adventure Education?**

Adventure Education is a relatively recent discipline compared to other forms of education and is often confused with Environmental Education and Outdoor Education (Medina, 2009). Walsh & Aubry (2007) considered that

Adventure Education has evolved from Experiential Education, and Daniel (2009) thinks it has been influenced by sociology, psychology, progressive education, organized camping and programs that organize expeditions in the wild.

This form of education has been defined as “direct, active, and engaging learning experiences that involve the whole person and have real consequences” (Prouty, 2007). According to Walsh & Golins, (1976) it is a type of educational experience in which the one learning is involved in adventure activities, is confronted with challenges, and navigates a unique physical and social setting. Wikipedia describes it as form of learning through practical experiences based on adventure activities (1). Referring to its objectives, Priest & Gass (1997, quoted by Furman, 2011) said that Adventure Education aims at personal development through the use of specific activities.

It is agreed by most specialists that the birth of adventure education took place in 1941, when Kurt Hahn, Lawrence

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*Received:* 2018, April 6; *Accepted for publication:* 2018, April 24

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*https://doi.org/10.26659/pm3.2018.19.2.116*

Holt and Jim Hogan created a program named Outward Bound (Wilson, 1981, quoted by Ewert & Sibthorp, 2014). The course took a month and was looking to develop independence, initiative, ingenuity, self-confidence and physical condition for sailors (Hattie et al., 1997; Richards, 1991). Adventure education programs have continued aiming towards one or all of the objectives named above, and new objectives have been defined and targeted later in time. If we are to generalize the main objective of Adventure Education, this is best done by Hattie et al. (1997), who found that it aims to create conditions for the development of inter- and intrapersonal skills. A study conducted by Sibthorp (2000) on instruments used in adventure education research performed from 1988 to 2000 identified self-esteem and self-concept as the main objectives since they were listed by one third of the programs.

**Research results in Adventure Education**

Research in the field supports the idea that adventure education develops several skills, and this is best viewed when studying the meta-analysis of the Adventure Education research and the related domains.

Cason & Gillis conducted a meta-analysis on the research carried out on adventure education programs that worked with people over 11 years old, and out of 43 studies, 62% of participants had a positive development as a result of the program in which they took part. The studies showed positive results on self-concept, behavior as evaluated by others, locus of control, academics, school attendance, attitude and also clinical aspects. Out of a total of 147 effect sizes taken from those studies, 23 analyzed behavior as assessed by others, and the statistic evidenced that based on the Effect Size a participant was better off than over 35% of those that did not take part in the studies (Cason & Gillis, 1994).

Hattie et al. (1997), in their meta-analysis of 96 research papers published between 1968 and 1994, identified 40 different items on which adventure education had positive contributions, and they grouped them in 6 categories: academic, leadership, self-concept, personality, interpersonal skills and adventuresome. Table I shows all 40 items found by Hattie and his colleagues. However, they also cautioned that not all the studies had statistically significant results.

**Table I**

Items on which adventure education had positive contributions (Hattie et al., 1997)

Category	Items
Academic	Academic general, Academic direct
Leadership	Conscientiousness, Decision-making, Leadership-general, Leadership-teamwork, Organization ability, Goals, Time management, Values
Self-concept	Physical ability, Peer relations, General self, Physical appearance, Academic, Confidence, Self-efficacy, Family, Self-understanding, Well-being, Independence
Personality	Femininity, Masculinity, Achievement Motivation, Emotional stability, Aggression, Assertiveness, Locus of control, Maturity, Neurosis reduction
Interpersonal skills	Cooperation, Interpersonal communication, Social competence, Behavior, Relating skills, Recidivism
Adventuresome	Challengeness, Flexibility, Physical fitness, Environmental awareness

Kellert (1998, quoted by Furman, 2011) conducted an overview of the studies performed on participants in NOLS, Outward Bound and Student Conservation Association programs, and was able to identify as benefits the development of self-esteem, self-concept and interpersonal relationships, as well as an increase in interest for community work.

A more recent meta-analysis, covering 197 studies of therapy administered through adventure education, identified positive effects on academics, behavior, social development, fitness, self-concept, family relations and clinical issues (Bowen & Neill, 2013). The studies used in this meta-analysis were published between 1967 and 2012. Studies on Adventure Therapy also found a significant reduction in substance use by the participants (Norton et al., 2014).

A study carried out in 196 participants in a 15 weeks program of adventure education came to the conclusion that adventure education may even improve moral and ethical reasoning (Smith et al., 2002).

Neill (2008) mentions that the impact of Outdoor Education programs on aspects such as self-concept, locus of control and social skills has been indicated on average to be small to moderate.

Goldenberg and his colleagues performed a qualitative study on participants in rope courses, an activity frequently used for adventure education, and noticed that the participants considered that they had developed leadership skills (5.9%), communication skills (9.4%), awareness of others and oneself (6.1%), trust (10.2%), and most considered that they had improved their teamwork skills (16.6%) (Goldenberg et al., 2000).

A later qualitative study conducted on 216 Outward Bound participants to see what they considered as outcomes, reported that they mentioned, listed in order of frequency, physical fitness (34.7%), relationships with others (20.8%), self-confidence (19.9%), self-reliance (16.7%), appreciation (16.7%), teamwork/cooperation (15.7%), personal growth related to challenges (15.7%) and knowledge/ awareness (15.3%). The students also mentioned that the transfer of skills to real life was the most important value of the program (Goldenberg et al., 2005).

A study run by Martin (2001, quoted by Goldenberg et al., 2005) evidenced that most of the participants in the Outward Bound program felt they had developed personally and socially, especially in relation to self-confidence and interpersonal relations.

For participating groups, outcomes include increased trust between team members, better communication, conflict resolution, group leadership and teamwork (Sibthorp et al., 2007; Paisley et al., 2008).

Despite being one of the initial objectives of Outward Bound, the program that started Adventure Education, and despite being mentioned by participants in qualitative studies (Goldenberg et al., 2005), physical development is not listed as an objective in programs, seems to be ignored as an outcome, and is rarely approached in studies.

Based on available studies, the outcomes identified are reached by various people from children aged 11 to adults, from normal populations of students or managers to at risk

individuals or delinquents, from individuals signing up for a program to groups taking part together. No significant difference was recorded in Effect Size between the normal populations and delinquents, but Effect Sizes for adults were greater than for school-based students (Hattie et al., 1997; Bowen & Neill, 2013).

Schiraldi (2000, quoted by Ewert & Sibthorp, 2014) argued that adventure programs can also bring benefits to participants suffering from posttraumatic stress.

### **How Adventure Education works**

Walsh & Aubry (2007) mentioned that one advantage of adventure education programs is that they are fun and young people are willing to take part in the activities and are enthusiastic about it.

In adventure education the participants are placed in situations where they have to focus on their strengths and need to overcome increasingly difficult challenges by working as part of a team, creating in this way opportunities for the development of traits such as emotional stability, assertiveness and social competence (Hattie et al., 1997).

Reaching the objectives set during the course is considered to be an important requisite for the development of self-efficacy and self-esteem (Walsh & Aubry, 2007). Goldenberg and his team found in their qualitative study that as individuals challenge themselves and grow, they feel better about themselves (Goldenberg et al., 2005). The combination of challenge, assimilation and success leads to the development of character (McKenzie, 2000; Witman, 1995).

Richards (1977, quoted by Neill, 2008) considers that social skills are developed in this kind of programs by including the creation of a supportive atmosphere between the members of the group, providing opportunities for participants to experience different social roles and placing the participants in social situations that require active responses. Adventure activities are usually performed in a group and it is expected for the group members to develop interpersonal connections, to adopt normal group behaviors and to contribute to solving group tasks (Oakes et al., 1995, quoted by Neill, 2008).

The activities have a major role in the success of the programs, alongside the environment, the instructor, the group and the participants themselves (Walsh & Gollins, 1976). Most specialists agree with this, but some added that information processing is also very important (Ewert & Sibthorp, 2014).

Adventure education programs use activities such as rock climbing, mountain climbing, canoeing, cycling, rafting, camping, horse riding and caving (Priest & Gass, 1977, quoted by Furman, 2011), sailing and orienteering (Lubans et al., 2012), but the most often used activity is backpacking (Furman, 2011). Some authors say that the challenges given by these activities develop problem-solving skills and so the participants will be less affected by the problems that might appear in real life (Ebata & Moos, 1994; Herman-Stahl et al., 1995).

Goldenberg and his team conducted a study aimed at connecting the outcomes with different course components and found connections between rock climbing and teamwork/relationship with others, between expeditions

and physical fitness as well as leadership skills, between camping and awareness/ knowledge, and the solo experience was connected with self-reliance (Goldenberg et al., 2005).

In the urban setting, adventure education is predominantly performed through rope courses, which are a series of towers, cables, platforms and obstacles that create a physically challenging environment for the participants (Priest & Gass, 1997, quoted by Furman, 2011). The elements require good group communication and critical thinking and are used as a metaphor, which will help transfer the skills learned to real life (Furman, 2011). High rope courses use fear to help individual development, while the low elements are more about team work (Rohnke, 1989, quoted by Moote & Wodarski, 1997). Rope courses can be adjusted according to needs and space and can target improvement in communication, development of leadership skills, or they can work on trust or team work (Goldenberg et al., 2000). It has been said that rope courses create the right context for intra- and interpersonal development (Green et al., 2000). Some consider that high rope courses help participants to test their limits and to develop trust (Meier et al., 1980, quoted by Goldenberg et al., 2000). Conley et al. (2007) analyzed the research carried out on rope courses and identified positive results in teamwork, self-esteem, group cohesion and family satisfaction.

The activities are followed by a period of processing, where the group members are encouraged to share their experience and say how they believe the skills used could apply to different contexts (Goldenberg et al., 2000). Smith et al. (2002) argued that the noncompetitive aspect of the adventure activities, the reflection and the opportunity for self-evaluation given by these activities create an environment that encourages the development of morals and ethics in the participating students.

### **The characteristics of a successful Adventure Education program**

The specialists insist that an Adventure Education program needs to always have the following 5 compulsory characteristics: uncertainty of outcome, risk, unavoidable consequences, energetic activities and voluntary participation (Horwood, 1999, quoted by Stremba, 2009). At the same time, the model of the Outward Bound process, drawn by Walsh and Gollins (1976), describes the key elements of a program, each one with its own characteristics: participant, environment, group, activities, interaction, instructor and mastery of skills. McKenzie (2000), however, considers that information processing should replace the mastery of skills, as it is more important.

Lukner and Nadler (1997, quoted by Sibthorp, 2000) highlighted the fact that in order to be able to generalize and transfer the skills learned, the participants need to be placed in a new situation and to confront themselves with unique problems to be solved. According to Walsh and Gollins (1976), the activities must offer a challenge that creates the state of mind required for transformation. The activities should not be straightforward and the participant should explore the boundaries of the activity in order to

find the answers to his/her task (Chapman, 1992, quoted by Newhouse, 2002).

Some specialists consider that physical strain is the most important aspect (Gass, 1995; Ewert & Sibthorp, 2014), but participants should also be under mental and emotional stress (Walsh & Gollins, 1976); however, the load should be progressive (Walsh & Gollins, 1976; Ewert & Sibthorp, 2014). A study performed by Bisson (1998, quoted by McKenzie, 2000) shows that the success of the program is related to the order of the activities.

It is also important that the activities are adapted to the necessities of the group (Hopkins & Putman, 1993, quoted by McKenzie, 2000) and the tasks are achievable (Walsh & Gollins, 1976). They should have a clear beginning and end, and the completion of the task should be probable (Walsh & Gollins, 1976). However, some argue that there is benefit from failure as well (Witman, 1995).

According to Ewert and Sibthorp (2014), an important aspect is that there should be clear consequences to any action. The activities should be selected in such a way that those involved will immediately see the connection between perseverance, effort, commitment and success, as well as that between laziness, ambiguity and failure (McGowan, 1986, quoted by Newhouse, 2002).

The adventure activities should take place in an unfamiliar environment (Walsh & Gollins, 1976), as this will induce positive stress (eustress) in the participants, which is beneficial to the development of the self-concept (Nadler, 1993, quoted by McKenzie, 2000). Specialists agree that the best environment is the natural one, as it comes with its own set of rules that have real consequences and cannot be ignored (McKenzie, 2000). Some even go as far as to say that nature has spiritual powers that help with the transformation process (Bacon, 1983, quoted by McKenzie, 2000). In the adventure therapy programs, nature has been called a "co-facilitator of change" (Taylor et al., 2010, quoted by Norton et al., 2014)

The group size is recommended to be between 7 and 15 members as this allows for character diversity but group problems can still be solved easily (Walsh & Gollins, 1976). For the success of the program it is considered to be important to have clear goals set up from the beginning for both individuals and the group (Meyer & Wegner, 1998, quoted by McKenzie, 2000). However, the efficiency of the group also depends on the cohesion and the trust created between the group members (McKenzie, 2003).

When it comes to length, after their meta-analysis of 47 studies, Cason and Gillis (1994) concluded that longer programs are more efficient; however, a study conducted by Neill found a weak positive relationship between the length of the programs and the outcomes (Neill, 2008).

A very important aspect of adventure education is exposure to risk, which facilitates personal development (Miles & Priest, 1990, quoted by Newhouse, 2002). However, there needs to be a balance between the level of perceived risk and the level of competence, or the program will fail to reach its objectives. It is also important to understand that emotional risk (not having the skills you thought you had) and social risk (appearing incompetent in front of others) are just as important as physical risk, during the program (Ewert & Sibthorp, 2014).

## **Prosocial and antisocial behavior**

E. Jolley, translated by Florean D (2007), defines in the Psychology Dictionary the term sociability as "a quality of the individual to appreciate, search and bond socially with ease", but he says it also refers to the overall capacity to communicate and interact. Walker et al. (1995, quoted by Quinn et al., 1995) defined social skills as a set of competences needed for the initiation and maintenance of positive social relations with other people, and Ewert & Sibthorp (2014) maintained that social competences, also known as interpersonal or social skills and interpersonal intelligence, refer to the skills required to navigate social situations. These skills or behaviors are considered desired or necessary in order to interact efficiently in society (2).

Moscovici (1998) considered that the main components of social competence are assertiveness, communication, both verbal and nonverbal, empathy, cooperation, attention towards others, gratification or support, problem solving skills and projection of the self-image.

A prosocial behavior is considered to be an action meant to help others (Selfe, 2013). Prosocial behavior is defined as voluntary actions that bring benefits to one or more people or to society in general (Carlo et al., 2007; Eisenberg et al., 2005). In their paper, Scourfeld and his colleagues describe prosocial behavior as being a positive interaction with other people that includes help, cooperation, comforting and sharing (Scourfeld et al., 2004).

Prosocial tendencies are influenced in children by both genetics and the environment in which they grow (Scourfeld et al., 2004). Colleagues of the same age are a source of inspiration when it comes to moral behavior and development of social skills (Hart & Atkins, 2002; Chung-Hall & Chen, 2009). Carlo et al. (2007) carried out a study on 600 students over 5 years and their research showed that prosocial behavior dropped during high school, only to return around grade 12. Prosocial behavior can be motivated by empathy and sympathy, internal moral standards, but also by the attempt to gain social recognition in a group (Selfe, 2013). Several studies have shown that self-efficacy also has a positive impact on prosocial attitudes (Bandura, 1997, quoted by Walsh & Aubry, 2007; Vancouver et al., 2002). Even though most specialists agree that prosocial behavior develops in childhood and adolescence, some studies argue that it does not actually change in time (Furman, 2011).

Research shows that a low level of prosocial behavior is usually accompanied by high levels of antisocial behavior (Veenstra et al., 2008). Solomon and his colleagues consider that the lack of consideration for peers, social alienation and a self-centered attitude can lead to an increase in violence, delinquency, vandalism and school indiscipline in teenagers (Solomon et al., 1985, quoted by Furman 2011). Similarly, following a review of the studies conducted on this topic, Lonigro and his colleagues (Lonigro et al., 2014) came to the conclusion that antisocial behavior is directly related to weaknesses in social-cognitive skills. Patterson (1986, quoted by Quinn et al., 1995) maintained that antisocial behavior starts at home when inappropriate behavior is not challenged, but then it develops in school,

when the child uses the same behavior that was successful at home. Walker et al. (1995, quoted by Quinn et al., 1995) said that social skills contribute to the school integration of the students, and antisocial students have problems either because they do not understand the social contexts or because they do not have the skills needed to deal with a certain situation.

Donellan et al. (2005) found a robust relationship between low self-esteem and externalizing problems, considering that low-self esteem could foretell future antisocial behavior.

### **Adventure Education and social behavior**

In order to change their antisocial behavior, children need to learn how to use interpersonal skills and how to influence their environment through prosocial behavior (Quinn et al., 1995). According to Neill (2008), good expedition behavior, developed during adventure expeditions, is quite similar to prosocial behavior.

The development of interpersonal skills or social skills and competences has been an objective of adventure education from the creation of the Outward Bound program (Hattie et al., 1997) and is a major objective of most outdoor education programs (Barret & Greenaway, 1995, quoted by Neill, 2008). A 2012 analysis of the impact of physical activity programs on the social and emotional state of children and young people that do not have the skills and values necessary to become responsible members of society found 15 relevant studies, of which 7 were based on outdoor adventure (Lubans et al., 2012). The National Outdoor Leadership School was created on the initiative of Paul Petzoldt, because he considered that the lack of adventure is the main cause of antisocial behavior in the young generation (Bisson, 2009).

A meta-analysis of 150 studies in 2004 showed that there is enough evidence for the association of outdoor adventure programs with positive effects on interpersonal relationships and social skills such as communication, group cohesion and team work (\*\*\*, 2005). Qualitative research performed by Martin (2001, quoted by Goldenberg et al., 2005) on participants in the Outward Bound program has evidenced that most of the participants feel that they have developed personally and socially, especially regarding aspects such as self-confidence and interpersonal relationships. The study conducted by Goldenberg and his colleagues highlighted similar results, with the participants naming "the relations with others" and "team spirit" as an outcome more often than any other (Goldenberg et al., 2005).

Different programs have started using adventure as a means of stopping antisocial behavior. One example is Behavior Management through Adventure, a program based on 4 components: adventure activities, therapy, positive group processing and evaluation, which had very good results in a study on recidivism, carried out between 1991 and 2001 in Georgia (Walsh & Aubry, 2007). At the same time, Project Adventure has organized counseling programs based on adventure for young offenders since 1981, with the intention to stop antisocial behavior and develop prosocial behavior in the participants (Walsh & Aubry, 2007). Rope courses seem to be often used with

at risk teenagers exposed to emotional and behavioral problems (Conley et al., 2007).

Research has shown that adventure education programs are successful in inducing changes in at risk populations. West & Crompton (2001) conducted an overview of 16 studies on young people considered at risk and found that 14 of them had significant positive changes regarding the self-concept. A later study found 5 papers supporting the idea that adventure education programs have beneficial effects on young people considered at risk. Some of the benefits identified are an improvement of self-concept, personal value, resilience and self-control (Lubans et al., 2012). In a qualitative study, as part of a program based on adventure activities implemented among problem students from 3 London schools, the teachers observed a reduction in disturbing behaviors, better teamwork and better relations between the participants and their teachers or colleagues (Sandford et al., 2008). The American Institute for Research also performed a study to see the outcomes of outdoor education programs in grade 6 students from California, and included in the list of identified benefits both an improvement of social skills and a reduction of problematic behaviors (\*\*\*, 2005). A meta-analysis of 28 studies, focused on the impact of outdoor expeditions on the delinquent behavior of problematic children, also reached the conclusion that the intensity of physical activities positively influenced the participants (Wilson & Lipsey, 2000, quoted by Neill, 2008).

### **Conclusions**

1. Adventure Education is a form of education directed at the development of intra- and interpersonal skills. This form of education is considered successful in reaching outcomes such as improved communication, teamwork, leadership, conflict resolution, self-concept, self-control, resilience, self-confidence and self-esteem.
2. The absence of interpersonal skills, a low self-esteem and a negative self-concept seem to be three of the main reasons for the development of antisocial behavior in students.
3. Adventure Education programs have managed to reduce antisocial behavior in participants, which we consider could in fact prevent the development of such behavior in the young generations and furthermore, might actually help develop prosocial behavior.

### **Conflicts of interests**

There are no conflicts of interest.

### **Acknowledgments**

The paper is based on the theoretical foundations of the first author's ongoing thesis.

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## **Project for the multidisciplinary team and their management in the context of special education**

*Proiect privind alcătuirea echipei multidisciplinare și managementul acesteia în contextul învățământului special*

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### **Abstract**

The fundamental purpose of a *multidisciplinary team* as a group of professionals that collaborate, design, make decisions and achieve specific activities to attain the proposed objectives is to respect the children's superior interest by the decisions made and the activities carried out. The structure of the multidisciplinary team is conditioned by the nature of the child's special educational needs and the type of necessary support.

The instruments available to the multidisciplinary team in the planning and coordination of individualized psychopedagogical and social services are: *the personalized service plan (PSP), the personalized intervention plan (PIP), the individualized educational program, the case study and the psycho-pedagogical sheet*. These instruments contribute to the elaboration of *case management*, which represents a method for coordinating assistance activities in the interest of children and their families, being aimed at developing and using their potential and resources.

*The inclusion of children with special educational needs* is an intervention in their growth and development, for their school and social integration. To attain this desideratum, a team is formed, whose members collaborate to ensure the necessary conditions.

In special education, the established objectives can be achieved and problems can be productively addressed only by work within a multidisciplinary team, which is the main source of energy for continuous learning and improvement.

**Keywords:** multidisciplinary team, special educational needs, personalized service plan, individualized educational program

### **Rezumat**

*Echipa multidisciplinară* ca grup de profesioniști care colaborează, proiectează, ia decizii și realizează activități specifice pentru atingerea obiectivelor propuse are ca scop fundamental respectarea interesului superior al copilului, prin deciziile luate și activitățile derulate. Structura echipei multidisciplinare este condiționată de natura cerințelor educaționale speciale ale copilului și de tipul de sprijin necesar.

Instrumentele de care dispune echipa multidisciplinară în activitatea de planificare și coordonare a serviciilor psihopedagogice și sociale individualizate sunt: *planul de servicii personalizat (PSP), planul de intervenție personalizat (PIP), programul educațional individualizat, studiul de caz și fișa psihopedagogică*. Aceste instrumente contribuie la elaborarea *managementului de caz* care reprezintă o metodă de coordonare a activităților de asistență desfășurate în interesul copilului și al familiei, având ca obiectiv dezvoltarea și valorificarea potențialului și a resurselor de care acesta dispune.

*Incluziunea unui copil cu cerințe educative speciale* este o intervenție în creșterea și dezvoltarea acestuia, pentru integrarea lui școlară și socială. Pentru atingerea acestui deziderat, se constituie o echipă care colaborează în vederea asigurării condițiilor necesare.

În educația specială nu se pot atinge obiectivele stabilite și nu pot fi abordate productiv problemele decât prin lucrul în echipa multidisciplinară care este principala sursă de energie pentru învățarea și îmbunătățirea continuă.

**Cuvinte cheie:** echipă multidisciplinară, cerințe educative speciale, plan de servicii personalizat, program educațional individualizat

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Received: 2018, March 14; Accepted for publication: 2018, March 28

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<https://doi.org/10.26659/pm3.2018.19.2.123>

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## The role and sequence of actions in a multidisciplinary team

A *multidisciplinary team* is a group of professionals that collaborate, design, make decisions and achieve certain specific activities to attain the proposed objectives, with the fundamental purpose of respecting the children's superior interest by all the decisions made and the activities carried out (Lacey, 1988).

Setting up work teams to approach interventions for persons in at-risk situations initially occurred as a concern of the medical and nursing sector. Medical diagnostic decisions, surgery proposals, referral to specialized services or institutions are promoted as decisions made within a team of professionals, who usually belong to different intervention areas. However, this work strategy has also been developed in the social sector and, over the past years, in the educational sector, mainly in special education (York et al., 2009).

*The role of the multidisciplinary team* is synthesized in four official documents of the Romanian legislation regarding activity in special and integrated education:

- *Order 18/2001* regarding the complex evaluation of children with disabilities; this evaluation should be performed by a multidisciplinary team including at least: a psychologist, a pedagogist and/or an educator, a doctor and/or a nurse, and a social assistant (\*\*\*. 2001).

- *Order 49 of 19 January 2011* for the approval of the framework methodology on prevention and intervention in a multidisciplinary team in cases of violence against children and violence in the family (2).

- *Multidisciplinary and inter-institutional intervention methodology for exploited children and children at risk for labor exploitation, victims of human trafficking, as well as migrant Romanian children, victims of other forms of violence on the territory of other states* (3).

Establishing, treating and solving a particular case for a child with special educational needs require specialized intervention. This type of intervention requires the following sequence of actions and conditions (Verza, 2002):

- establishing the case, by determining the key problem;
- a detailed analysis, including strengths and necessities;
- mentioning the services and the favorable development environment;
- setting up a *personalized service plan* (PSP);
- setting up a *personalized intervention plan* (PIP), for each service or activity;
- recovery/habilitation/rehabilitation intervention through certain services and/or activities;
- periodic reevaluation, with the performance of changes and recommendations in PSP and PIP, referral to other environments or services;
- continuous monitoring of the case;
- identifying the necessary conditions for intervention;
- common effort of all team members to support the child;
- team work;
- ensuring a family, educational and habilitation/

rehabilitation environment favorable to growth and development,

- social integration in all its forms, as a predicted result.

Guided by the common aspiration to support the child, the team members, together with the family, which offers the adequate environment for growth and development, are in fact the *intervention team* (IT), also called *multidisciplinary team* (MT).

In order to obtain the expected results, team work is necessary. Establishing, implementing and monitoring the intervention can only be achieved by team work. *The inclusion of children with special educational needs* is in fact an intervention in their growth and development, for their school and social integration. To attain this desideratum, a team is formed, whose members collaborate to ensure the necessary conditions (Vr ma et al., 2005).

## The development and management of the multidisciplinary team

The structure of the multidisciplinary team is determined by the nature of the child's special educational needs and the type of necessary support – for example, if the parents and child wish to participate only in extracurricular activities or to partially study certain disciplines.

*The multidisciplinary team* can have the following structure:

- the group educator/teacher/form master;
- all the other teachers – psycho-pedagogues and specialty teachers (foreign languages, physical education and sport, musical education, art education, religion, etc.) involved in the education and training of children;
- the support teacher, if needed by the child;
- the personal assistant, if necessary;
- the management of the education institution;
- the psychologist of the education institution;
- specialists of rehabilitation services (speech therapist, kinesiologist) – if the child benefits from such services – or the family doctor and/or the treating doctor;
- the parent/parents, legal tutor or caretaker;
- the child – when his/her presence is necessary.

However, there is no standard component of the multidisciplinary intervention team. The number of the team members and their areas of activity depend on the nature of the educational needs and wishes of children, their families and, certainly, on the capacity of the education institution to meet the child's special educational needs. During the intervention stages, the structure of the team may change, depending on the child's and family's needs and interests.

The success of the work effort of the *multidisciplinary team* can only be ensured by meeting the following requirements:

- clarity of pursued objectives;
- efficiency of communication (listening, communication, evaluation);
- effective participation of all members;
- negotiation in choosing the best solutions (respect of the child's superior interest);
- making clear and prompt decisions in favor of the

child;

- solving conflicts;
- thorough planning of work sessions;
- information exchange, regarding both the child and the family, as well as at professional level;
- group culture – round tables can be organized so that all participants can feel important (Lacey, 1988).

Organizing, planning and creating a favorable climate are basic elements in meeting these requirements.

The obligations of the team members include:

- knowing their role and responsibilities;
- conscientiousness and punctuality;
- manifestation of a cooperative and open attitude;
- flexibility and empathy;
- expertise in the field;
- prompt intervention in crisis situations, as well as in other actions (Lacey, 2000).

Thus, the multidisciplinary team can be redefined in the context of special education as a team of professionals from various fields (training/education, special pedagogy, health, social assistance) and parents/tutors, whose aim is to evaluate the child's situation (by various strategies and methods). Putting together their individual professional experiences, these decide in consensus about the most beneficial and effective way of action in favor of the child with special educational needs. The beneficiary (child), parents and professionals get actively involved, together, in the planning and execution of the team's actions. All team members know the individualized action plan and are responsible for its achievement.

### **Psycho-pedagogical intervention instruments of the multidisciplinary team**

Considering that “*all pupils who participate in the educational process should benefit from educational differentiation because they have different abilities, different interests, different previous experiences, and come from different social environments*” (Ghergu, 2013), there was a need to develop specific instruments and to approach psycho-pedagogical intervention strategies aimed at supporting the work of the multidisciplinary team, so that all children with special educational needs might benefit from quality education.

The instrument for the planning and coordination of individualized psycho-pedagogical and social services, aimed at continuity, complementarity and quality of services, in response to the numerous and complex requirements of people with special needs, is called a *personalized service plan (PSP)* (Ghergu, 2011).

This plan is elaborated by the multidisciplinary team and is used by all its members in solving a particular case, as an approach that starts from a deep knowledge of the beneficiary, followed by adequate measures and effective improvement and/or rehabilitation solutions, with the involvement and responsibility of the family/carers (Chalfant & Pysh, 1989).

The final aim of PSP is to respond to the children's special needs, in order to support their development, to form, maintain and improve personal autonomy and facilitate social integration.

Another planning and coordination document, permanently used as an instrument for the achievement of the objectives proposed through the service plan, for the beneficiary, by intervention areas, is the *personalized intervention plan (PIP)*. This is a component of the service plan that includes the immediate objectives, activities, strategies and means used, the duration of each activity, as well as the modalities for evaluating and revising the intervention activities.

A particular form of the personalized intervention plan, intended for pupils with special needs included in the mass education system, is the *individualized educational program (IEP)*. This presents the way of accessing the mass school curriculum, the necessary resources, the objectives and the educational evaluation of pupils. Individualized educational planning aims to adapt education to the individual needs dictated by differences between pupils (Booth & Ainscow, 2002).

Therefore, *the individualized educational program* is a document that guides the educational activity of a pupil with a certain type of educational needs, the way of adaptation and/or modification of the school curriculum, of teaching methods and material resources, providing at the same time the criteria, instruments and procedures for measuring progress and the rate of achievement of directly formulated objectives, in order to meet the unique needs of that pupil. In the design, revision and development of this document, a mixed team is involved, which includes parents/legal tutors and school teaching staff. This document allows access of pupils with special educational needs to the general mass school curriculum, mentioning the adaptations, services and support adequate for the pupils' individual needs, so that these can participate alongside their schoolmates in the school curriculum, overcoming the difficulties caused by their disability or special situation.

*The case study* represents a research and qualitative evaluation method focusing on the detailed analysis of an individual/group or a particular aspect, in a given circumstance, using various sources of information (questionnaires, documents, evidence, interviews, etc.). It can also focus on a distinct event or on a problematic situation in the school, professional or daily life of an individual or a group found in a distinct circumstance, with serious implications for their subsequent evolution (Boco et al., 2017). One or more persons, directly related to the case, collect the information using specific methods, procedures, instruments and evaluation tests, then they exchange information and ideas that lead to the most plausible explanations regarding that particular situation and the identification of effective measures and solutions for the case. If the case study is conducted by a team, its members may fulfill similar or complementary roles (Ghergu, 2013).

It is recommended that all team members participate in the stages of conceptualization and establishment of the problems subjected to research.

The permanent work instrument developed at the beginning of the activity with the child is termed *psycho-pedagogical sheet*. This is used in practical activity in the field of special psycho-pedagogy and school counseling, as well as in speech therapy or educational therapy. The

psycho-pedagogical sheet is filled out periodically with relevant data regarding the child's development dynamics.

Filling out the psycho-pedagogical sheet, regardless of its complexity, requires the collaboration of teaching staff, specialists in the field of psychology, and parents. Such a sheet, well structured and formulated, is of great help for the pupil's school and professional guidance.

The multidisciplinary team fulfills a number of functions that define the purpose and objectives for which it has been formed. These functions can be summarized as: information function, organization function, mobilization function, collaboration function and support function (Harris, 1995).

In the case of the protection of children with special educational needs, *case management* is a method of coordination of all assistance activities carried out in the interest of children and their families, being aimed at developing and using all their potential and resources, as well as the opportunities existing in the community (Norwich, 1997). This method coordinates actions from different areas (medical, educational, psychosocial), offered by specialists, institutions and organizations concerned with the support of children and their families in solving the problems encountered, by setting up a *service plan* (1). Case management is also intended to eliminate the problems that may occur due to fragmentation of services and interventions, personnel mobility or deficient coordination of specific service providers for children and their families (Ainscow, 2016).

Knowing the fact that special education currently faces many challenges, but also opportunities, team work is necessary in order to develop new ways of thinking and practical engagement. Work in a multidisciplinary team is the main source of energy for continuous learning and improvement. Effective teams do not appear over night, they are the result of intentional design and development efforts.

## Conclusions

1. The development of multidisciplinary teams, their optimal management, and their educational activity with children with special educational needs, in formal contexts, are necessary.

2. The psycho-pedagogical intervention instruments of the multidisciplinary team facilitate the planning and coordination as well as the implementation of individualized psycho-pedagogical and social services.

## Conflicts of interests

The authors declare no conflict of interest.

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- (3) <https://lege5.ro/Gratuit/ge2daobygi/metodologia-de-interventie-multidisciplinara-si-interinstitutionala-privind-copiii-exploatati-si-af-ati-in-situatii-de-risc-de-exploatare-prin-munca-copiii-victime-ale-traficului-de-persoane-precum-si-aflati-in-situatii-de-risc-de-exploatare-prin-munca-copiii-victime-ale-traficului-de-persoane>

## RECENT PUBLICATIONS

### Book reviews

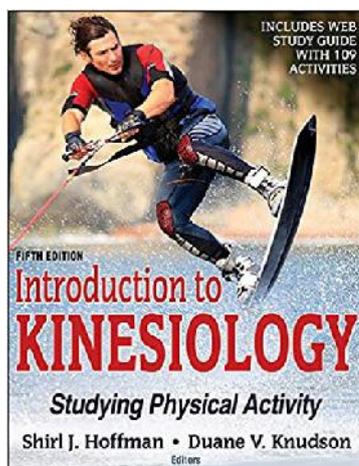
**Introduction to kinesiology: studying physical activity.  
Fifth edition with web study guide**

(Introducere în kinesiologie: studiul activității fizice,  
ediția a 5-a, cu ghid de studiu pe web)

Editors: *Shirl Hoffman & Duane Knudson*

Human Kinetics, 2018

488 pages; price: £ 111.99



Whenever a book is released in successive versions, this speaks not only about its value and interest, but also about the dynamics of the field it addresses, and the book we present this time is already at its 5<sup>th</sup> edition now, in less than two decades. A record very difficult to match by a scientific work but easy to understand nowadays, when after realizing the integrated nature of the mind and body, physical activity (PA) has started to be considered a real signature of humanity.

Just from the first edition of this work, the editors - Shirl J. Hoffman and Duane V. Knudson, professors of kinesiology and biomechanics, respectively - primarily intended to deliver essential knowledge to students attending courses in PA, kinesiology, and exercise and sport science, but also to be of help to all practitioners involved in sport and exercise science professions. So that once again, continuing to maintain the three-section structure, apart from delivering key concepts, theories and explanations to long-standing issues that kinesiology professionals are confronted with, the present version comes with new and/or updated specific perspectives and solutions in the recently connected fields of the profession;

e.g. public health, allied health, evidence-based practice, equality, etc., all this copious information being offered through the text and the extensive ancillaries attached.

The first part – “Experiencing PA” - starts with the 2<sup>nd</sup> chapter, which develops the 7 spheres of PA experience, namely the spheres of self-sufficiency, self-expression, work, education, leisure, health, and competition. Then, after explaining what “PA as a signature of humanity” means (see an excerpt here: <http://www.humankinetics.com/excerpts/excerpts/physical-activity-as-a-signature-of-humanity>), the 3<sup>rd</sup> chapter continues with demonstration that PA experiences mainly depend on subjective factors that affect people’s enjoyment, which finally makes the subjective experiences of clients so important to kinesiology professionals.

Part II contains 7 chapters and is dedicated to “the scholarly study of PA”. Consequently, it first deals with the philosophy, history and sociology of PA, the other 4 chapters presenting the essential topics related to the field of motor behavior, exercise psychology, biomechanics and physiology, respectively. All the chapters of this part have the same structure, with 4 subchapters. They explain why the respective knowledge is necessary to kinesiologists, what specialists in this field do, and which its history and research methodology are.

The last part, “Practicing a profession in PA”, consists of 6 chapters and is of particular interest for professionals and decision makers from physical education faculties in Romania. This is so because although formally, the professions in PA are already distributed to the same directions as in USA or other developed countries – i.e. health and fitness (chapter 12), therapeutic exercise (13), physical education (14), coaching and sport instruction (15), and sport management (16), while the curriculum and especially the knowledge effectively acquired by students at the time of graduation is far from what a professional in the field really needs to know. The explanation is that - similarly to what was happening during the communist period both regarding the entrance examination and the study period - the greatest part of interest and time continues to be allocated to practices in different sports, not to the core theoretical knowledge and practical skills specific to the future profession.

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## EVENTS



MINISTRY OF NATIONAL EDUCATION  
 CLUJ COUNTY SCHOOL INSPECTORATE



### The educational health prevention project *Sport – an alternative for a healthy life*, the 2017-2018 spring stage

Proiectul educa ional i de preven ie în s n tate *Sportul – alternativa pentru o via s n toas* , etapa de prim var 2017-2018

We are pleased to remind that for several years now, on the initiative of Cluj County School Inspectorate, the Romanian Medical Society of Physical Education and Sport and the *Palestrica of the Third Millennium-Civilization & Sport* journal have involved in a long-term project targeting the rural middle school pupils. This project comprises a number of spring, autumn and winter rural school competitions, which are organized regularly through a form of collaboration between Cluj County School Inspectorate, the management of the organizing schools, local mayor offices, the Romanian Medical Society of Physical Education and Sport and certainly, the sponsors of the events. In addition to these events, the Gheorghe Moceanu Symposium, a scientific and sports meeting, is intended to be organized annually in Iclod commune, Cluj county. The events held in Borsa were rescheduled in the autumn, to numerically balance the competitions.

#### The Annual County School Cup in Athletics (5) Cupa anual a Inspectoratului școlar Judeean la atletism (5)

In the 2017-2018 school year, the competition entitled the Annual County School Cup in Athletics was scheduled for 19 April 2018. Like in the previous years, this event, having both an urban and a rural component, took place under good auspices. A total number of 484 pupils from both school environments (rural and urban) participated in the first stage, and 300 pupils qualified for the final stage.

The general rankings are presented in the tables below:

##### Rural grades III-IV

Place	School	Total points
1	Frata Middle School	1085
2	Baciu Middle School	1030
3	Ioan Alexandru Middle School	761

##### Rural grades V-VI

Place	School	Total points
1	Frata Middle School	1161
2	Rachitele Middle School	1157
3	Soporu de Câmpie Middle School	1063

##### Rural grades VII-VIII

Place	School	Total points
1	Frata Middle School	1132
2	Soporu de Câmpie Middle School	1082
3	Avram Iancu Middle School, Beli	1004

##### Urban grades III-IV

Place	School	Total points
1	Octavian Goga Middle School, Huedin	1221
2	Ioan Bob Middle School, Cluj-Napoca	1080
3	Avram Iancu Middle School, Dej	1044

##### Urban grades V-VI

Place	School	Total points
1	Ioan Opri Middle School, Turda	1187
2	Ioan Bob Middle School, Cluj-Napoca	1129
3	Avram Iancu Middle School, Dej	1128

##### Urban grades VII-VIII

Place	School	Total points
1	Nicolae Titulescu Middle School, Cluj-Napoca	960
2	Constantin Brâncuși Middle School, Cluj-Napoca	890
3	Ioan Bob Middle School, Cluj-Napoca	880

#### The sports competitions in C m ra u (7) Întregerile sportive de la C m ra u (7)

The sports competitions in C m ra u are different from the other competitions through the organized events. These are as follows: 4 athletic events: 40 m, 50 m and 60 m *sprint* by age categories; *running long jump*; *rounders ball throw*; 100 m, 150 m and 200 m *relay*; and in addition to these, *tug of war* – teams.

This year, the competition was attended by 14 teams from 14 middle schools in Cluj county, to which the middle school team of the “Samuil Micu” Theoretical High School

in S rma u was added. The participating localities were the following: Apahida, Bon ida, Bor a, C ianu, C m ra u, C eiu, C tina, Frata, Geaca, Jucu de sus, Mociu, Palatca, Poieni, S rma u.

## Results

(40 m, 50 m, 60 m sprint, running long jump, rounders ball throw, mixed relay, tug of war - teams)

Place	Girls 9-10 years	Boys 9-10 years	Girls 11-12 years	Boys 11-12 years	Girls 13-14 years	Boys 13-14 years
	<i>40 m sprint</i>		<i>50 m sprint</i>		<i>60 m sprint</i>	
1	Szekely Diana-Mociu	Todea Sebastian-Frata	Dobo Paula-C m ra u	Borza i Sergiu-Mociu	Moldovan Dana-C m ra u	Deac Darius-C tina
2	Vendenberg Alina-Bon ida	Gorgan Daniel-C m ra u	Ga par Raluca-C m ra u	Chertes Felician-Apahida	Rosta Simona-S rma u	Pop Damian-Frata
3	Feren i Denisa-C m ra u	P curar Denis-Jucu	Chi Denisa-Frata	Smarandache Alex-Jucu	Buchei Denisa-C eiu	Moldovan Paul-Bon ida
	<i>Long jump</i>					
1	Szekely Diana-Mociu	Todea Sebastian-Frata	Mihalte Oana-S rma u	Chertes Felician-Apahida	Moldovan Dana-C m ra u	Nagy Sebastian-C tina
2	Mure an Cristina-C eiu	Petean Ionu -C ianu	Ga par Raluca-C m ra u	Borza i Sergiu-Mociu	Rosta Simona-S rma u	Vere Cristian-Mociu
3	Buc a Diana-Mociu	Man Sorin-C m ra u	Dobo Paula-C m ra u	Smarandache Alex-Jucu	Buchei Denisa-C eiu	Mocean Marian-C m ra u
	<i>Rounders ball throw</i>					
1	Szekely Diana-Mociu	Rosta Andrei-Geaca	Ga par Raluca-C m ra u	Smarandache Alex-Jucu	Buchei Denisa-C eiu	Ple Luca-Frata
2	Alm an Florina-C eiu	Cristea Alin-Frata	Alb Adela-Poieni	Covaci Darius-Bor a	Moldovan Andreea-Frata	P I cean Alexandru-Jucu
3	Banga Lorena-C m ra u	Strate Sergiu-C tina	Covaci Minerva-C eiu	Dioseghi Ciprian-C tina	Moldovan Cristina-C eiu	Filaton C t lin-C ianu
	<i>4x100 mixed relay</i>		<i>4x150 mixed relay</i>		<i>4x200 mixed relay</i>	
1	“Liviu Dan” Middle School, Mociu		C m ra u Middle School		C m ra u Middle School	
2	Frata Middle School		Frata Middle School		C tina Middle School	
3	C ianu Middle School		“George Bari iu” Middle School, Jucu de Sus		“Liviu Dan” Middle School, Mociu	
Place	Tug of war	General ranking				
1	Bon ida Middle School	C m ra u Middle School				
2	C eiu Middle School	Frata Middle School				
3	Bor a Middle School	“Liviu Dan” Middle School, Mociu				

Physical education teacher: Sorina L pu te; Director: Prof. Felician tefan Prunean-Bago i; Mayor: Marcel Iancu Mocean

## “Gheorghe Moceanu” Symposium, 3 May 2018 (8) Simpozionul „Gheorghe Moceanu”, 3 mai 2018 (8)

The 8th edition marked the 180<sup>th</sup> birth anniversary of Gh. Moceanu, considered the frst Romanian physical trainer. The efforts for organizing the event were shared by School Inspector Prof. Dr. Cristian Potor , the Mayor of the Iclod commune Emil Pâr oc, and the Director of the Iclod Middle School Prof. Liana Dobocan.

The previous editions were as follows:

2008 - 17-18 May, Orman, a meeting outside the Symposium editions marking Gh. Moceanu’s 170<sup>th</sup> birth anniversary (1838). It was this year that the school in Orman was named after Gheorghe Moceanu and a

memorial plaque was placed on the community center building.

2009 - 14 June, 1<sup>st</sup> edition in Cluj-Napoca

2010 - 3 June, 2<sup>nd</sup> edition in Dej

2011 - 19 May, 3<sup>rd</sup> edition in Câmpia Turzii

2012 - 7 June, 4<sup>th</sup> edition in Dej

2013 - 6 June, 5<sup>th</sup> edition in Cluj-Napoca

2014 - 12 June, 6<sup>th</sup> edition in Turda

2015 - 20 June, 7<sup>th</sup> edition in Iclod-Orman

2018 - 3 May, 8<sup>th</sup> edition in Iclod, marking Gh. Moceanu’s 180<sup>th</sup> birth anniversary.

**Cristian Potor , Laura Ionescu**  
 cristipotora@gmail.com  
 lauraionescu2005@yahoo.com

## Annual County School Cup in Athletics



The excitement before the beginning of the competition



The cups for the winners



The last indications



Preparation for the start



Start to the endurance event



Runner during the race

**The sports competitions in C m ra u (7)**



One of the series of the sprint race



Award ceremony



Pupils and teachers awarded alike



Together at the award ceremony



The tribune of the stadium in C m ra u



The team of referees

**“Gheorghe Moceanu” Symposium, 3 May 2018 (8)**



The mayor of the Iclod commune, Emil Pâr oc, fanked by the vice-mayor of the commune, school inspector Cristian Potor , and the school director Liana Dobocan, at the inauguration of the new sports grounds



The same team at the inauguration



Spectators and participants in the inaugural tour



The new basketball and football-tennis ground inaugurated on this occasion



Simina Aurelia Neag, from *Iuliu Ha ieganu* School, during the presentation at the Symposium



View of the Symposium Proceedings

## 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 University 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 address 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, Objective-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, Vișan D et al. Probleme de pedagogie în sport. *Educație Fizică și Sport* 2000; 25(4):2-8.

*Books:* Drăgan I (coord.). *Medicina sportivă*, Editura Medicală, 2002, București, 2002, 272-275.

*Chapters from books:* Huleac I, Blatu O. Fiziologia senescenței. In: Huleac I. (sub red.) *Fiziologia umană*, Ed. Medicală, București, 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](http://www.pm3.ro) "Instructions for Authors", at our e-mail address [palestrica@gmail.com](mailto: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 Haieganu" University of Medicine and Pharmacy of Cluj-Napoca and The Romanian Medical Society of Physical Education and Sports in collaboration with the Cluj County School Inspectorate

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

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

Year of first publication: 2000

Issue: quarterly

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

## **ÎN ATENȚIA COLABORATORILOR**

### **Tematica revistei**

Ca tematică, revista are un caracter multidisciplinar orientat pe domeniile biomedical, științe, efort fizic, științe sociale, aplicate la activitățile de educație fizică și sport, astfel încât subiectele tratate să apară în mai multor specialități din aceste domenii. Principalele rubrici sunt: „Articole originale” și „Articole de sinteză”.

Exemplificăm rubrica „Articole de sinteză” prin teme importante expuse: stresul oxidativ în efort fizic; antrenamentul mental; psihoneuroendocrinologia efortului sportiv; cultura fizică în practica medicului de familie; sporturi extreme și riscuri; determinanți emoționali ai performanței; recuperarea pacienților cu suferințe ale coloanei vertebrale; sindroame de stres și psihosomatic; educația olimpică, aspecte juridice ale sportului; efortul fizic la vârstnici; tulburări ale psihomotricității; pregătirea sportivilor la altitudine; fitness; biomecanica mișcărilor; testele EUROFIT și alte metode de evaluare a efortului fizic; reacții adverse ale eforturilor; endocrinologie sportivă; depresia la sportivi; dopajul clasic și genetic; Jocurile Olimpice etc.

Dintre articolele consacrate studiilor și cercetărilor experimentale notăm pe cele care vizează: metodica educației fizice în sportul; influența unor ioni asupra capacității de efort; profilul psihologic al studentului la educație fizică; metodica în gimnastica sportivă; selecția sportivilor de performanță.

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

Autorii celor două rubrici de mai sus sunt medici, profesori și educatori din învățământul universitar și preuniversitar, antrenori, cercetători științifici etc.

Alte rubrici ale revistei sunt: editorialul, actualitățile editoriale, recenziile unor cărți - ultimele publicate în domeniu, la care se adaugă și altele prezentate mai rar (invenții și inovații, universitară, preuniversitară, forum, remember, calendar competițional, portrete, evenimente științifice).

Subliniem rubrica „Memoria ochiului fotografic”, unde se prezintă fotografii, unele foarte rare, ale sportivilor din trecut și prezent.

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

Scopul principal al revistei îl constituie valorificarea rezultatelor activităților de cercetare precum și informarea permanentă și actuală a specialiștilor din domeniile amintite. Revista își asumă și un rol important în îndeplinirea punctajelor necesare cadrelor didactice din învățământul universitar și preuniversitar precum și medicilor din rețeaua medicală (prin recunoașterea revistei de către Colegiul Medicilor din România), în avansarea didactică și profesională.

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

Revista este publicată trimestrial iar lucrările sunt acceptate pentru publicare în limba română și 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) și listate, prin poșta pe adresa redacției. Lucrările colaboratorilor rezidenți în străinătate și ale autorilor români trebuie expediate pe adresa redacției:

### **Revista «Palestrica Mileniului III»**

Redactor șef: Prof. dr. Traian Bocu

Adresa de contact: palestrica@gmail.com sau traian\_bocu@yahoo.com

Adresa poștală: 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 activității de cercetare a colaboratorilor și, în special prin stimularea participării acestora la competiții de proiecte. Menționăm că articolele publicate în cadrul revistei sunt luate în considerare în procesul de promovare în cariera universitară (acreditare obținută în urma consultării Consiliului Național de Atestare a Titlurilor și Diplomelor Universitare).

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

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

### **STRUCTURA ȘI TRIMITEREA ARTICOLELOR**

Manuscrisul trebuie pregătit în acord cu prevederile Comitetului Internațional 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 pagin** : 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.

**Ilustrațiile**:

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

**Tabelele** vor fi numerotate consecutiv în text, cu cifre romane, și vor fi trimise ca fișiere separate, însoțite 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 instituției, adresa poștală și 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 consacrați). Toate articolele vor avea un rezumat în limba engleză. Nu se vor folosi prescurtări, note de subsol sau referințe.

*Premize și obiective*: descrierea importanței studiului și precizarea premizelor și obiectivelor cercetării.

*Metodele*: includ următoarele aspecte ale studiului:

Descrierea categoriei de bază a studiului: de orientare sau aplicativ.

Localizarea și perioada de desfășurare a studiului. Colaboratorii vor prezenta descrierea timpului, sexul (genul), vârsta și alte variabile socio-demografice.

Metodele și instrumentele de investigație folosite.

*Rezultatele* vor prezenta datele statistice descriptive și inferențiale obținute (cu precizarea testelor statistice folosite): diferențele dintre măsurtoarea inițială și cea finală, pentru parametri investigați, semnificația coeficienților de corelație. Este obligatorie precizarea nivelului de semnificație (valoarea  $p$  sau mărimea efectului  $d$ ) și a testului statistic folosit etc.

*Concluziile* care au direct legătură cu studiul prezentat.

Articolele de orientare și 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 și Metode (inclusiv informațiile etice și statistice), Rezultate, Discutarea rezultatelor, Concluzii (și 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 menționa: numele tuturor autorilor și inițialele prenumelui, anul apariției, titlul articolului în limba originală, titlul revistei în prescurtare internațională (caractere italice), numărul volumului, paginile

*Articole*: Pop M, Albu VR, Vișan D et al. Probleme de pedagogie în sport. *Educația Fizică și Sportul* 2000; 25(4):2-8.

*Cărți*: Drăgan I (coord.). *Medicina sportivă aplicată*. Ed. Editis, București 1994, 372-375.

*Capitole din cărți*: Hulea I, Blatu O. Fiziologia senescenței. În: Hulea I. (sub red.) *Fiziologia umană*. Ed. Medicală, București 1996, 931-947.

Începând cu revista 4/2010, fiecare articol va trebui să se bazeze pe un minimum de 15 și un maximum de 100 referințe bibliografice, în majoritate articole nu mai vechi de 10 ani. Sunt admise un număr limitat de cărți și articole de referință (1-3), cu o vechime mai mare de 10 ani. Un procent de 20% din referințele bibliografice citate trebuie să menționeze literatură străină studiată, cu respectarea criteriului actualității acesteia (nu mai vechi de 10 ani).

**Procesul de recenzare (peer-review)**

Într-o primă etapă toate materialele sunt revizuite riguros de cel puțin doi referenți competenți în domeniu respectiv (profesori universitari doctori și doctori docenți) pentru ca textele să corespundă ca fond și formă de prezentare cerințelor unei reviste serioase. După această etapă materialele sunt expediate referenților revistei, în funcție de profilul materialelor. În urma observațiilor primite din partea referenților, redacția comunică observațiile autorilor în vederea corectării acestora și încadrării în cerințele de publicare impuse de revistă. Acest proces (de la primirea articolului până la transmiterea observațiilor) durează aproximativ 4 săptămâni. Cu această ocazie se comunică autorului dacă articolul a fost acceptat spre publicare sau nu. În situația acceptării, urmează perioada de corectare a articolului de către autor în vederea încadrării în criteriile de publicare.

**Conflicte de interes**

Se cere autorilor să menționeze toate posibilele conflicte de interes incluzând relațiile financiare și de alte tipuri. Dacă sunteți siguri că nu există nici un conflict de interes vă rugăm să menționați acest lucru. Sursele de finanțare ar trebui să

fe men ionate în lucrarea dumneavoastr .

### **Preciz ri**

Preciz rile trebuie f cute doar în leg tur cu persoanele din afara studiului, care au avut o contribu ie substan ial la studiul respectiv, cum ar f anumite prelucr ri statistice sau revizuirea textului în limba englez . Autorii au responsabilitatea de a ob ine permisiunea scris din partea persoanelor men ionate cu numele în cadrul acestui capitol, în caz c cititorii se refer la interpretarea rezultatelor i concluziilor acestor persoane. De asemenea, la acest capitol se vor face preciz ri în cazul în care articolul valorif c rezultate par iale din anumite proiecte sau dac acesta se bazeaz pe teze de masterat sau doctorat sus inute de autor, alte preciz ri.

### **Criterii deontologice**

Redac ia va r spunde în timp util autorilor privind acceptarea, neacceptarea sau necesitatea modif c rii textului i î i rezerv dreptul de a opera modif c ri care vizeaz forma lucr rilor.

Nu se accept lucr ri care au mai fost tip rite sau trimise spre publicare la alte reviste. Autorii vor trimite redac iei odat cu articolul propus spre publicare, într-un f ier word separat, o declara ie scris în acest sens, cu angajamentul respect rii normelor deontologice referitoare la citarea surselor pentru materialele folosite (referin e bibliograf ce, f guri, tabele, chestionare).

Pentru articolele originale, în conformitate cu îndeplinirea condi iilor Declara iei de la Helsinki, a Protocolului de la Amsterdam, a Directivei 86/609/EEC i a reglement rilor Comisiilor de Bioetic din loca iile unde s-au efectuat studiile, autorii trebuie s prezinte:

- acordul informat din partea familiei, pentru studiile pe copii i juniori;
- acordul informat din partea subiec ilor adul i, pacien i i sportivi, pentru participare;
- adeverin de Malpraxis pentru medici, pentru cercet rile/studiile pe subiec i umani;
- adeverin din partea Comisiilor de Etic , pentru protocolul de studiu pe subiec i umani;
- adeverin din partea Comisiilor de Bioetic , pentru protocolul de studiu pe animale.

Datele vor f men ionate în articol la sec iunea Material i metod . Documentele vor f ob inute înainte de începerea studiului. Se va men iona i num rul de înregistrare al adeverin ei din partea Comisiilor de Etic .

Materialele trimise la redac ie nu se restituie autorilor, indiferent dac sunt publicate sau nu.

### **ÎN ATEN IA SPONSORILOR**

Solicit rile pentru spa iile de reclam , vor f adresate redac iei revistei "Palestrica Mileniului III", Str. Clinicilor nr. 1, cod 400006 Cluj-Napoca, România. Pre ul unei pagini de reclam full color A4 pentru anul 2012 va f de 250 EURO pentru o apari ie i 800 EURO pentru 4 apari ii. Costurile public rii unui Logo pe coper ile revistei, vor f stabilite în func ie de spa iul ocupat. Plata se va face în contul Societ ii Medicale Române de Educa ie Fizic i Sport, CIF 26198743. Banca Transilvania, sucursala Cluj Cod IBAN: RO32 BTRL 0130 1205 S623 12XX (LEI).

### **ÎN ATEN IA ABONA ILOR**

Revista "Palestrica Mileniului III" este tip rit trimestrial, pre ul unui abonament f ind pentru str in tate de 100 Euro pentru institu ii, i 50 Euro individual. Pentru intern, pre ul unui abonament institu ional este de 120 lei, al unui abonament individual de 100 lei. Men ion m c taxele de difuzare po tal sunt incluse în costuri.

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Preciz m c începând cu anul 2010 a fost introdus taxa de articol. Ca urmare, to i autorii semnatari ai unui articol vor achita împreun suma de 150 Lei, în contul Societ ii Medicale Române de Educa ie Fizic i Sport publicat mai sus.

Autorii care au abonament vor f scuti i de aceast tax de articol.

Alte informa ii se pot ob ine online de pe [www.pm3.ro](http://www.pm3.ro) „Pentru autori” sau pe adresa de mail a redac iei [palestrica@gmail.com](mailto:palestrica@gmail.com) sau pe adresa po tal : Str. Clinicilor nr.1 cod 400006, Cluj-Napoca, România, Telefon:0264-598575.

### **INDEXAREA**

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

Prof I: revist de studii i cercet ri interdisciplinare

Editor: Universitatea de Medicin i Farmacie „Iuliu Ha ieganu” din Cluj-Napoca i Societatea Medical Român de Educa ie Fizic i Sport, în colaborare cu Inspectoratul colar al Jude ului Cluj

Nivelul de atestare al revistei: revist acreditat în categoria B+ de CNCS în perioadele 2007-2011 i atestat CMR din anul 2003 i în prezent

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Anul primei apari ii: 2000

Periodicitate: trimestrial

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