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ORIGINAL STUDIES

Inf uence of the observation method as a selection procedure in the performance of Algerian goalkeepers

Inf uența metodei observației ca procedură de selecție în performanța portarilor algerieni

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Abstract

Background. Many East European countries have revealed the weaknesses of the traditional method and have attempted to develop identif cation methods underpinned by scientif c theory and evidence.

Aims. The present study was intended to determine the strengths and weaknesses of naked-eye appreciation practice by our coaches as a method for the selection of potential goalkeepers.

Methods. To achieve this objective, this comparative study tested 28 goalkeepers at the end of the f rst half of the season by the Penalty Kick Test, 'T' Drill Test, Ruler Drop Test (TR) and anthropometric parameters (BH, BMI, WC, and BW). The subjects were distributed into three groups depending on their success in the penalty test (PK%: GP1≈50% - GP2≈60% -GP3≈70% success).

Results. Based on the applied statistical methods and success in the penalty kick test, our results conf rm the weakness of traditional methods recognized by scientists through their subjectivity in assessing the amount of body fat and its effect on physical performance. The disadvantages and the subjectivity of the observation method used to detect the errors of the GK body shape and their correction by training was concluded in the present study.

Conclusions. To forecast the success of talented goalkeepers in adult elite competition, anthropometric and physical characteristics are actually crucial to discriminate talented from non-talented soccer players. For this purpose, we recommend our coaches to support their observations. Setting up predisposing tests is required to enhance the credibility and objectivity of decisions in selecting/detecting or evaluating the progress of players in the long term or in the short term.

Keywords: observation method, selection, performance of Algerian goalkeepers.

Rezumat

Premize. Numeroase țări est-europene au evidențiat slăbiciunile metodei tradiționale și au încercat să elaboreze metode de identif care susținute de teorii și dovezi științif ce.

Obiective. Scopul acestui studiu a fost determinarea punctelor forte și slabe ale practicii de apreciere cu ochiul liber de către antrenorii noștri ca metodă de selecție a potențialilor portari.

Metode. Pentru realizarea acestui obiectiv, acest studiu comparativ testează 28 de portari la sfârșitul primei jumătăți a sezonului, pe baza testului loviturilor de penalty, testului T de agilitate, testului timpului de reacție (TR) și a parametrilor antropometrici (H, IMC, CT și G). Subiecții au fost distribuiți în trei grupe în funcție de succesul la testul loviturilor de penalty (PK%: GP1≈50% - GP2≈60% -GP3≈70%).

Rezultate. Pe baza metodelor statistice aplicate și a succesului la testul loviturilor de penalty, rezultatele noastre conf rmă slăbiciunile metodelor tradiționale recunoscute de cercetători prin subiectivitatea aprecierii cantității de grăsime corporală și a efectului acesteia asupra performanței f zice. Acest studiu concluzionează cu privire la dezavantajele și subiectivitatea metodei observației utilizate pentru detectarea erorilor de morfologie a portarilor și la corecția acestora prin antrenament.

Concluzii. Pentru predicția succesului portarilor la nivel competițional de elită la categoria adulți, caracteristicile antropometrice și f zice sunt de importanță crucială pentru a diferenția între jucătorii de fotbal talentați și cei netalentați. În acest scop, recomandăm antrenorilor noștri să-și susțină observațiile. Este necesară utilizarea unor teste de predispoziție pentru creșterea credibilității și obiectivității deciziilor în selecția/depistarea sau evaluarea progresului jucătorilor pe termen lung sau scurt.

Cuvinte cheie: metoda observației, selecție, performanța portarilor algerieni.

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Introduction

The process of player selection and team formation in multi-player sports is a complicated multi-criteria problem. As conf rmed by scientists, our national football team never reached its cruising speed as long as the traditional method was used as a selection means in Algerian football. Zerf et al. (2016a) criticized the identif cation of overweight by the naked eye. According to FIFA, top overweight goalkeepers (Cantor & Konin, 2006) are asked to work harder (Kindall & Winkin, 2000) due to their extra pounds. Similar studies regarding the impact of anthropometric parameters on physical performance, as well as the limitations of traditional methods putting our coaches at risk for injuries in selecting their goalkeepers have been conducted (Zerf, 2016). Studies in various Eastern European countries have reported the weakness of the traditional method, which must be supported by scientif c theories of evidence, as its observations are based on the naked eye of coaches (Wolstencroft, 2002; Zerf et al., 2016b). Papaioannou & Hackfort (2014) evidenced the multitude of problems that occur when coaches base their decisions on this method to differentiate talents from non-talents.

In general, the selection of soccer players and the formation of a team are based on judgments formulated by coaches relying on the best available information (Tavana et al., 2013), which is also the case of our national football team (Zerf et al., 2016c). Ziv & Lidor (2011) recommend that coaches should adopt a judicious approach when selecting their test protocols and devices for the assessment of the physiological attributes of goalkeepers.

Hypothesis

The present study aimed to examine the strengths and weaknesses of the observation method, which is the most used in selecting potential goalkeepers. A qualitative and quantitative analysis based on football demands was performed, supported by a literature review. While quantitative values give the general trend, qualitative values suggest specif c training for positions, which are shown in similar studies to be guidelines in establishing an individualized training and evaluation program in the players' career plan. The application of a scientif c method to conf rm the coaches' observations is currently supported. Setting up predisposing tests is required to enhance the credibility and objectivity of decisions in selecting/detecting or evaluating the progress of players in the long term or in the short term.

Material and methods

Research protocol

Based on suggestions that football coaches working with GKs need to know, professional adult GKs usually have a body mass under 5% (kg/m2) over the ideal weight related to height, more body fat requiring different physical and physiological training aspects (Sporis et al., 2009). In order to achieve this objective, our protocol was based on the study of relations between the selected players' performance in penalty stops vs others variables, which allowed us to distribute the sample into three groups depending on their success in the penalty test (PK%: GP1≈50% - GP2≈60% -GP3≈70% of success).

a) Period and place of the research

All goalkeepers who participated in the present study were aged under 17 years, with the best ranking in the Oran Football League for 2015-2016.

b) Subjects and groups

Homogeneity and normality were calculated based on age, training, and skills in the penalty kick test, the time of reaction (Ruler Drop Test) and Agility T-test, and anthropometric parameters (BH, BW, BMI, WC) at the end of the f rst half of the season used in the current study.

c) Tests applied

- Anthropometry, body composition, and body fat percent

The body height (BH-cm) and body mass (BW-kg) of each player were measured, and the body mass index (BMI) (kg/m2) was calculated, as well as the body fat percentage based on waist circumference, which was highly correlated with the amount of intra-abdominal or visceral fat. To evaluate the results, we referred to the normative data of BMI by the World Health Organization according to Brown et al. (2006). For waistlines WC (cm), we agreed with the normative data provided by Medical Science (Zerf et al., 2016a).

- Ruler Drop Test (TR)

The objective of this test is to monitor the athlete's reaction time. To undertake this test, a meter ruler and an assistant are required:

The assistant holds the ruler between the outstretched index f nger and thumb of the athlete's dominant hand so that the top of the athlete's thumb is level with the zero centimeter line on the ruler.

The assistant releases the ruler and the athlete catches the ruler between their index f nger and thumb as quickly as possible.

The assistant records the distance between the bottom of the ruler and the top of the athlete's thumb, where the ruler has been caught.

The test is repeated 2 more times and the average value is used for the assessment.

To evaluate the results, we referred to normative data adapted by Davis (2000) for 16 to 19 years of age.

- 'T' Drill Test (TD)

Subjects start from the standing point at cone A, and they are asked to run in a straight line to go to B. Then, they move to cone C, which is on the left side. After touching cone C, they move to the right and touch cone D. Finally, they run again to the left, touch cone B, and run back to the starting position. Every subject performed three trials with the best score recorded for analysis.

- Test penalty kick skills (PK%)

In the penalty kick scenario, the goalkeeper is the primary threatening source in the environment. In this study, we recruited 5 senior players who framed their shots well. Each goalkeeper had to stop the 5 shots. All penalties went by turns. Non-framed penalties were not counted (Hoffman, 2006). Based on results, we calculated the penalty stops % as a protocol tested in the present study.

d) Statistical processing

The results were analyzed using SPSS software (version 20.0; SPSS, Inc., Chicago, IL). To assess the differences between the selected players, ANOVA followed by LSD was

Table I
Descriptive statistics

Variables	Penalty stops	EN	Mean	SD	Shapiro-Wilk	p≤0.05	Levene's	p≤0.05	F	p≤0.05
BW	50%	14	68.3	5.70	0.97	0.59	0.28	0.76	0.07	0.94
	60%	6	67.35	5.25						
	70%	8	67.21	6.71						
	Total	28	67.65	5.70						
BH	50%	14	176.85	7.39	0.96	0.32	2.17	0.14	26.67	0.53
	60%	6	173.50	3.39						
	70%	8	176.87	6.01						
	Total	28	176.14	6.311						
BMI	50%	14	28.28	0.632	0.98	0.89	0.59	0.56	17.67	0.00
	60%	6	27.51	0.43						
	70%	8	26.66	0.69						
	Total	28	27.65	0.92						
WC	50%	14	91.35	3.56	0.97	0.77	1.38	0.27	24.12	0.00
	60%	6	87.41	1.51						
	70%	8	81.72	3.12						
	Total	28	87.75	5.160						
TR	50%	14	15.07	1.47	0.95	0.33	1.563	0.79	13.19	0.00
	60%	6	13.54	1.12						
	70%	8	12.31	0.72						
	Total	28	13.95	1.70						
TD	50%	14	15.13	1.78	0.53	0.32	0.23	0.77	24.27	0.00
	60%	6	12.25	0.50						
	70%	8	11.26	0.49						
	Total	28	13.41	2.19						

Legend
Waist circumference‡ 32.3 to 40.2(in)* 61.8 to 68.0(cm) via Sportsmen, more suggestive of high abdominal/central obesity - body mass index (BMI) overweight≥25 - Ruler Drop Test Average 15.9 - 20.4 cm, 'T' Drill Test Average 10.13 - 10.37 sec, penalty kick skills - fewer goals.

performed using each variable. The results are described as mean and SD. The level of signif cance was established at $p<0.05$. Shapiro-Wilk and Levene's tests were conducted to calculate normality and homogeneity. The correlation was calculated individually (Tables I and II).

Results

The present study was designed to examine the strengths and weaknesses of processes practised by Algerian coaches in selecting potential goalkeepers, based on the penalty test, as a protocol to predict the weaknesses of our selected goalkeepers.

Through Table I based on applied statistics, our results indicate that our total sample is classif ed as overweight, given the BMI, with a WC over 80 cm as a health risk affecting the physical body shape and size (Edwards & Fernández, 2017). The ANOVA and LSD tests were signif cant via all comparisons, unlike for body weight (BW) and body height (WH). However, all comparisons by LSD were in favor of groups with more success in the penalty test, see Table II. All Pearson correlations between the penalty stops % success and other studied variables were strongly negative, as shown in Table III. Evoked by researchers in weight-for-height relationships, BMI index as well as BMI for WC as indicators of body weight conf rm in the present study the need for a desirable normal body weight (Mahan et al., 2012) in our sample. Inappropriate body weight, body mass index (BMI) related waist sizes and body shape are reported to be factors suggestive of excess weight (Zerf, 2017), while its measurement is limited when using the naked eye as an approach for identifying potential goalkeepers. According to (Howley & Thompson, 2017), the negative inf uence of body fatness is correlated both mechanically and metabolically in most physical tasks that require translocation of body weight (Garrett & Kirkendall, 2000), which is illustrated by (Boron & Boulpaep, 2012) in excess body fat affecting movements from becoming f uid and more energetic. Body fat measurement is currently supported (Zerf et al., 2017a), relative to defects of the observation method, which bases its judgments on the naked eye to estimate anthropometric parameters (Zerf, 2016 a). Zerf (2016b) shows their effect on the training process in the long term (Gusic et al., 2017). In this study, the weight-for-height relationship is estimated to help control body fat loss, which should allow coaches to understand the post-game demand (Zerf et al., 2016b).

Table II
Differences based on the penalty stops percentage as a protocol in the present study.

Dependent variable	(I) KP	(J) KP	Mean difference (I-J)	Std. error	Sig.
BMI	50%	60%	.76381*	.30064	.018
		70%	1.61464*	.27307	.000
	60%	50%	-.76381*	.30064	.018
		70%	.85083*	.33274	.017
	70%	50%	-1.61464**	.27307	.000
		60%	-.85083*	.33274	.017
WC	50%	60%	3.94143*	1.52886	.016
		70%	9.63643*	1.38865	.000
	60%	50%	-3.94143*	1.52886	.016
		70%	5.69500*	1.69213	.002
	70%	50%	-9.63643*	1.38865	.000
		60%	-5.69500*	1.69213	.002
TR	50%	60%	1.52762*	.60251	.018
		70%	2.76554*	.54726	.000
	60%	50%	-1.52762*	.60251	.018
		70%	1.23792	.66686	.075
	70%	50%	-2.76554*	.54726	.000
		60%	-1.23792	.66686	.075
TD	50%	60%	2.87857*	.65042	.000
		70%	3.86357*	.59078	.000
	60%	50%	-2.87857*	.65042	.000
		70%	.98500	.71989	.183
	70%	50%	-3.86357*	.59078	.000
		60%	-.98500	.71989	.183

Legend
*. The mean difference is signif cant at the 0.05 level.

Table III
The correlation between the penalty test and other studied variables.

Variable	BMI	WC	TR	AT	KP
Penalty test	-0.765**	-0.809**	-0.716**	-0.793**	1

Legend
**. The correlation is signif cant at the 0.01 level (2-tailed).

Discussions

According to the data collected, in comparison with the normative data used in the present study, ANOVA and LSD tests are signif cant for all comparisons in favor of GKs with more success in the penalty test, conf rmed by Pearson correlation negatively correlated with other studied variables. Our results conf rm the def ciencies of the observation method based on the coach's naked eye. Anthropometric studies show that certain physical factors, including body fat, body mass, muscle mass and physique, signif cantly inf uence athletic performance (Moncef et al., 2012). This is documented in the case of this study by the weight for height and BMI for WC relationships as superior anthropometric parameters, which are indicators for the adjustment of body weight as a factor that inf uences performance, according to (Zerf et al., 2017b). The stability of body weight gain relative to the adjustment of body weight in correlation with GK performance is supported by the research team. In our opinion, an accurate assessment of body weight loss related to loads incorporated into the GK training program is required. Previous research has acknowledged immoderate body fat as a high-risk factor, injury being related to the increase of body mass index (BMI), leading to the exposure of athletes to a multitude of other risk factors, which requires an examination of the association between overweight and sports injury (Ezzat et al., 2014; Chaalali et al., 2016). Kraemer et al. (2012), as well as (Zerf, 2016a) evidence their consequences on physical performance and the relation between body composition and athletic performance; a high level of f tness correlated with an optimal athletic body composition should be maintained (Mączka et al., 2017). Body composition analysis is part of physical f tness assessment to estimate the gain of fat correlated with lean muscle levels (Halfmann, 2012) as expected by the global target weight loss program, including the reduction of body fat (Griff n, 2015) to achieve the desired body composition. Our recommendations are directed to our f tness coaches and especially to goalkeeper coaches:

To control and record changes in body fat levels, appreciated by the inf uence of exercise training on physiological and performance changes related to weight loss as an assessment program (Kraemer et al., 2012).

To seek desirable physical characteristics associated with anthropometric parameters (Robertson et al., 2015).

To integrate our goalkeepers in all training sessions (Hadjar et al., 2016), including constant exercise (Di Iorio & Ferretti, 2004) to maintain or to improve physical f tness (Hoeger & Hoeger, 2015) as well as basic skills.

To use the scientif c method (programming or evaluating) as a fundamental and signif cant practice to achieve Olympic level performance in any sports discipline (Prajapat, 2015).

Conclusions

1. Because of the differences obtained by the research team, it can be concluded that the method of observation is a more subjective method for the selection of Algerian GKs. For this reason, we recommend to our Algerian coaches to establish their judgement on predisposing tests to enhance the credibility and objectivity of their decisions in selecting/detecting or evaluating the progress of their players in the long term or in the short term.

2. This study shows the limitations of traditional methods for selecting potential goalkeepers. Anthropometric characteristics interrelated with physiological demand assessment associated with body composition changes (body fat, bone and muscle) require a scientif c basis to quantify the load of training programs, allowing to improve physical performance in accordance with anthropometric levels.

Conf icts of interests
None.

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Respiratory physical therapy inf uence on the stress level in hypertensive persons in the age group 40-60 years

Inf uența kinetoterapiei respiratorii asupra nivelului de stres la persoanele hipertensive din grupa de vârstă 40-60 de ani

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Abstract

Background. The introduction of a program of respiratory physical therapy in people with essential hypertension in the age group of 40-60 years inf uences their stress level.

Aims. Hypertension is known as a cardiovascular risk factor that promotes coronary and cerebral atherosclerosis. Another cardiovascular risk factor, stress, is commonly associated with hypertension and may even be the generator of the latter. The increasing share of hypertensive people and the increasing presence of daily stress in human life have led us to study to what extent respiratory physical therapy, whose benef ts are known, can help reduce these risk factors.

Methods. This study, type application, was completed between September 2012 – August 2013 on a number of 24 subjects, divided in two groups, one experimental and the other control, diagnosed with essential arterial hypertension. Information on the stress level of the subjects before and after the application of respiratory kinetotherapy was gathered through some questions evaluating stress in 6 important areas. Each answer was given a number of points, and the overall score placed each subject in a certain stress level area (dangerously low, low, normal, high, dangerously high).

Results. The individual evolutions of the subjects of the experimental group show statistically signif cant differences between the tests, the mean of the experimental group being smaller, while the control group did not show any signif cant differences. In the comparative analysis between the groups, the effect size index (0.336) shows a small to moderate difference in favor of the experimental group (a lower stress level).

Conclusions. Reducing the level of stress in experimental research subjects gives respiratory physical therapy a psychotherapeutic role on those with essential hypertension.

Keywords: essential arterial hypertension, respiratory physical therapy, stress level.

Rezumat

Premize. Introducerea unui program de kinetoterapie respiratorie la persoanele cu hipertensiune arterială esențială, af ate în grupa de vârstă 40-60 de ani, inf uențează nivelul de stres al acestora.

Obiective. Hipertensiunea arterială este cunoscută ca factor de risc cardiovascular ce intervine în favorizarea aterosclerozei la nivel coronarian şi cerebral. Un alt factor de risc cardiovascular, stresul, se asociază frecvent hipertensiunii arteriale şi poate f chiar generator al acesteia din urmă. Ponderea crescută a persoanelor hipertensive şi prezenţa în continuă creştere a stresului cotidian în viaţa omului ne-au determinat să studiem în ce măsură kinetoterapia respiratorie, ale cărei benef cii sunt cunoscute, poate contribui la reducerea factorilor de risc amintiţi.

Metodă. Studiul de faţă, de tip aplicativ, a fost efectuat în perioada septembrie 2012 - august 2013 pe un număr de 24 de subiecţi cu vârsta cuprinsă între 40-60 ani, împărţiţi în două loturi, unul experimental şi altul martor, diagnosticaţi cu hipertensiune arterială esenţială. Informaţiile privind nivelul de stres al subiecţilor înainte şi după aplicarea kinetoterapiei respiratorii au fost colectate prin intermediul unor întrebări prin care a fost inventariat stresul pe 6 domenii importante. Fiecărui răspuns i s-a acordat un număr de puncte, iar punctajul general obţinut a încadrat f ecare subiect într-o anumită zonă a nivelului de stres (primejdios de scăzut, scăzut, normal, ridicat, primejdios de ridicat).

Rezultate. Evoluțiile individuale ale subiecților grupei experimentale arată existența unor diferențe semnif cative statistic între testări, media grupei experimentale f ind mai mică, în timp ce la grupa de control nu prezintă diferențe semnif cative. La analiza comparativă între loturi, indicele de mărime a efectului (0,336) arată existența unei diferențe mici spre mijlocie, în favoarea lotului experimental (un nivel de stres mai mic la acesta).

Concluzii. Reducerea nivelului de stres la subiecții cercetării experimentale conferă programelor de kinetoterapie respiratorie un rol psihoterapeutic asupra celor cu hipertensiune arterială esențială.

Cuvinte cheie: hipertensiune arterială esențială, kinetoterapie respiratorie, nivel de stres.

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Introduction

Hypertension is a condition, but also a cardiovascular risk factor. Numerous specialty studies have identif ed the association between blood pressure variability and increased mortality and cerebrovascular and coronary events in hypertensive patients (Bădilă, E. et al., 2013).

Moreover, researchers such as Rothwell, PM. et al. (2010) or Fratolla, A. et al. (1993), who have been following hypertensive persons for several years, show the relationship between increased blood pressure and target organ damage such as left ventricular hypertrophy.

Also, studies by Bădilă, E. et al. (2012) and Volpe, M., Tocci, G. (2009) conf rm the subclinical impairment of some organs (heart, kidneys, brain), explaining the need for a thorough evaluation of the hypertensive patient in terms of cardiovascular risk.

One of the cardiovascular risk factors commonly associated with high blood pressure, considered as a generator but also as a consequence of it, is stress that modern science def nes as any type of change causing physical, emotional or psychological pressure, which can contribute to the development of psychic resistance, awareness, new perspectives, a sense of control if its time of action is short (Davidji, 2015).

Too much benef cial stress (eustress) can degenerate into distress, manifesting by different reactions: anger, anxiety, sadness, depression, negative emotions that affect cardiac consistency and cause chaos in the body physiology (Servan-Schreiber, D., 2007). Stress, associated directly with hypertensive disease, generates overall sympathetic tone (Cinteză, M., 2012).

In dealing with distress, breathing exercises play an important role (Arădăvoaice, G., 2010), which contributes to better oxygenation of body tissues, regulates cardiac activity, develops thoracic capacity, stimulates digestive organs and immunity, stabilizes the mental state and favors a state of emotional balance. Exercises of deep breathing "release us from stress" (Rodríguez, J., 2007) and produce a general relaxation state by inhibiting the sympathetic vegetative nervous system (Mantak, C., William, UW., 2017).

Specialists emphasize the signif cant relationship between cardiovascular complications and increased blood pressure during stress (Pickering, TG., 1982).

Hypertension is a risk factor for cardiovascular complications (Parati, G. et al., 2013), but diff cult to control with conventional antihypertensive drug therapy (Parati, G. et al., 2008).

Thus, the treatment of this disease consists not only of a decrease of tension values, but also of cardiovascular risk (Mancia, G. et al., 2013). In this regard, specif c antihypertensive medication should be associated with other forms of treatment to achieve these goals.

We consider that the introduction of respiratory physical therapy in the treatment of patients with essential hypertension belonging to the age group of 40-60 years inf uences their stress level and contributes to the reduction of the number of cardiovascular ischemic events and to the increase of the quality of their life.

Objectives

The respiratory physical therapy objectives were adapted to the needs of the subjects of this study and consisted of the following:

- Balancing the nervous system and improving the mental state of the patients;
- Facilitating vasodilation in skeletal muscles in order to stimulate blood circulation
- Increasing vital capacity by increasing chest elasticity;
- Educating subjects and their families in order to adopt a rational lifestyle that will allow reducing as many cardiovascular risk factors as possible.

Hypothesis

The introduction of a program of respiratory physical therapy for hypertensive people in the age group of 40-60 years inf uences their stress level.

Material and methods

In accordance with the Helsinki Declaration, the Amsterdam Protocol and the Directive 86/609/EEC, the Ethics Committee's approval was obtained from the Department of Physical Education and Sport of the National University of Physical Education and Sports for the conduct of the experimental research.

We note the written consent of the subjects regarding their participation in the research.

Research protocol

a) Period and place of the research

The study was conducted between September 2012 and August 2013 at the *Spine Health* Medical Recovery Center in Bucharest. Patients enrolled in the study were treated on an outpatient basis for 12 consecutive weeks with three respiratory gymnastics programs (the f rst program between weeks 1-3, the second program between weeks 4-8, and the third program between weeks 9-12).

b) Subjects

The study was conducted on 24 subjects, 14 females and 10 males, aged 40-60 years, diagnosed with essential hypertension.

Of the 24 subjects, 4 withdrew during the f rst 3 weeks for personal reasons, and 8 subjects did not want to be actively involved in this research, establishing the composition of two groups, an experimental (E) group and a control (C) group, with a total number of 12 subjects.

The subjects of the study were selected according to the following inclusion criteria:

- Resting cardiac frequency above 60 beats/minute,
- Blood pressure below 180 mmHg,
- Absence of lung diseases,
- Absence of serious cardiovascular disease,
- Absence of angina pectoris or other signif cant symptoms during the exercise and effort test: vertigo, breathing diff culty (dyspnea), headache,
- Subjects accepting to cooperate in the research,
- Conscious involvement of the subjects.

c) Tests applied

The subjects who met the conditions for inclusion in the experiment were specif cally evaluated to know their

stress levels and assess to what extent respiratory physical therapy in people with essential hypertension reduces mental tension.

In this regard, we applied for a category C stress test. The lack of a category C stress test, validated on the Romanian population, determined the use of the test designed by Melgosa, J. (2000) and mentioned by Arădăvoaice, D. (2010).

The stress test included questions related to 6 important areas (items), namely: lifestyle, environment, symptoms, job/occupation, relationships and personality.

The interpretation of the test consists of locating the level of stress through the score obtained in a certain area:

- Zone 1 (from 0 to 48 points) - The level of stress is dangerously low.
- Zone 2 (48-72 points) – The stress level is low.
- Zone 3 (72-120 points) – The stress level is normal.
- Zone 4 (120-144 points) – The stress level is considered high.
- Zone 5 (≥ 144 points) - The stress level is dangerously high.

d) Studied moments

The subjects in the two (experimental and control) groups were evaluated at the beginning of the program (T1) and at the end of the 12 weeks (T2) from the start of the program.

The respiratory physical therapy program aimed at achieving the physiotherapy objectives recommended for subjects with essential hypertension, according to Mark, V., Dan, M. (2007), adapted to the needs of the subjects of this study.

The program was conducted under close supervision and the cardio-respiratory parameters (blood pressure, heart rate, respiratory rate, saturation of arterial blood in oxygen) were periodically measured. To avoid possible incidents, the subjects were individually worked. All subjects in the experimental group attended the 3 schedules.

Physical training was conducted in the heart area of low and moderate intensity exercise, using the value of 60-75% of the reserve heart rate. The progress of the intensity of the respiratory physical therapy session was gradual, individualized for each subject.

The central element of training was to establish synchronization of the slow movements of the body with the breathing rate. In all exercises breathing forced the rhythm, and the body followed it. The duration of each breath was increased progressively according to the ability of each subject to adapt to the effort and to focus on the movement and the ventilator process. Depending on the rate of respiration specif c to each subject, in the f rst 3 weeks the duration of the program was 20-30 minutes, in weeks 4-8 it was 40-90 minutes, and in weeks 9-12 it lasted 60-75 minutes.

The program included aerobic exercises represented by ample and slow movements of the upper, lower limbs and torso to increase the myocardial contraction force, as well as exercises based on coordination, balancing, trunk twisting to rebalance the nervous system. The exercises were aimed at awareness of the respiratory act through the correct learning and exercising of diaphragmatic, thoracic and complete breathing. Account was taken of the ability of each subject to expand the chest box during inspiration and to control the contraction of abdominal muscles during expiration. We emphasize the importance of achieving inspiration and expiration as slow, deep and prolonged as possible, and the execution of breathing phases at the nose, except for those exercises in which the expiration was sound and those requiring oral air removal due to the low tolerance of the subjects.

Of the following methodological aspects, we mention:

- Correct body alignment was observed;
- Exercises were performed from positions that facilitated breathing. The following positions were used: sitting with abducted lower limbs on the seat and on the f tness ball, lying down, lying on the side, lying on the knee, standing on the knee and standing with abducted lower limbs;
- Exercises were used in which the holding of the hands during practice blocked the scapulohumeral girdle, knowing that on a f xed scapula the mobilizing thoracic muscles (serratus anterior muscle, minor pectoral muscle) take a better support point than the mobilization of the upper limbs ;
- Exercises were aimed at toning the respiratory muscles to increase pulmonary volumes, to control and coordinate the respiratory rhythm with inf uences on the rhythm of the heart. Thus, the main muscles were: inspiratory muscles (diaphragm, external intercostals), accessory muscles (scalene, serratus posterior, sternocleidomastoid, pectoral, trapezius and dorsal) and expiratory muscles (abdominal, intercostal, lumbar, the sternum triangle);
- Exercises were aimed at toning the postural and perineal muscle;
- Exercises were performed in the mirror to observe the movement and thus, to allow the mind and body to work together, the will being important in their practice.

e) Statistical processing

For statistical characterization of the experimental group E and the control group C we used statistical indicators of the central trend (arithmetic mean, median, quartile 1 (Q1), quartile 3 (Q3)), indicators of spreading (standard deviation, minimum and maximum values, coeff cient of variation). The listed indicators were applied to the overall score obtained in the stress test.

The data of each subject were entered into the database. Analysis of statistical indicators and verif cation of statistical assumptions were carried out with the specif c SPSS 17.0 software (Statistical Package for the Social Sciences).

To compare the initial and f nal tests for the C group or the initial and f nal tests for the E group, we used the non-parametric Wilcoxon signed ranks for two paired samples in the control group and the non-parametric Friedman tests for multiple samples, and Wilcoxon signed ranks as a post hoc test with the Bonferroni correction for the Friedman test. The Bonferroni correction considers the signif cance threshold equal to 0.05 divided by the number of comparisons that can be made. In this case, $\alpha = 0.017$. The comparison of the f nal tests between the experimental group and the control group was performed with the non-parametric Mann-Whitney test for two independent samples.

Table I
General averages on items at the initial and f nal testing of the two groups.

Items	Averages on stress test items in the initial testing (T1) of the groups		Averages on stress test items in the f nal testing (T2) of the groups		p Group E T1-T2	p Group C T1-T2
	E	C	E	C		
Lifestyle	23.58	23.16	19.83	23.25	-	-
Environment	20.16	16.41	15	15.5	-	-
Symptoms	17.16	21.41	13.66	21.91	-	-
Job	17	14.58	15.08	13.08	-	-
Relationships	20.66	20.41	20.58	20.08	-	-
Personality	18.08	21.33	16.05	21.5	-	-
General score	124,83	125.33	109.92	124.58	0.006	0.720

Results

Table I ref ects the general averages of the stress test items at the initial and f nal evaluation of the two groups, and the value of the p (Asymp. Sig) coeff cient from the Wilcoxon nonparametric test resulting from the processing of the overall score obtained in the two tests.

In the case of the general score obtained by the E group in the stress test, the data distribution around the mean is relatively homogeneous in two tests, the coeff cients of variation being equal to 19.02% and 15.28% for the f nal test. The averages are equal to 124.83 points for the initial testing and 109.92 points for the f nal testing. The nonparametric Friedman test shows that there are signif cant differences between the mean scores of the tests (Chi-Square = 9.500, Asymp. Sig = 0.009 <0.05). The Post Hoc Wilcoxon test, with the Bonferroni correction, indicates signif cant differences between the f nal and initial testing (Z = -2.751 and p = 0.006 <0.017). Analysis of stress test items applied to C group shows, by means of the nonparametric Wilcoxon test, that there are no signif cant differences between the mean scores of the two tests (Z = -0.358, Asymp. Sig. (2-tailed) = 0.720> 0.05).

The comparative analysis shows that the overall score values accumulated by each subject in the stress test are distributed around the relatively homogeneous mean of both the experimental group and the control group, the coeff cients of variation being equal to 15.28% and 16.59%, respectively, at the f nal test.

The averages are equal to 109.92 in the experimental group and 124.58 in the control group. The non-parametric MANN-WHITNEY test shows that there are no signif cant differences between the mean scores of the two tests (Z = -1,647, Asymp. Sig. (2-tailed) = 0.100> 0.05).

Discussions

Half of the initial values obtained in group E subjects were in the area where stress is very dangerously high (values above 120), while the other 6 cumulated between 91 and 111 points, the latter thus being in the normal stress area with values ranging from 72-120.

After application of the respiratory physical therapy program, all subjects recorded overall scores, with the exception of subjects 10 (DL) and 11 (BM), whose scores increased insignif cantly, from 102 to 107 points and 103 to 111 points, respectively, continuing to be in the same normal stress area, where tension moments alternate with relaxation.

Statistical processing indicates large differences between the initial and f nal tests; the effect size index is 0.46, which entitles us to assert that breathing exercises contribute to improving mental tone.

The processing of the results obtained in the control group C establishes the lack of signif cant differences between the two tests. The effect size index (0.07) shows that there is a very small difference between the two tests.

In terms of stress, most (8) subjects are in the high stress area and need to f nd the resources to get a positive attitude. However, a decrease of the stress level in 2 subjects is seen: 1 (AF), female, 60 years old, retired, and 8 (MM), male, 41 years old, a plumber, as well as the maintenance of the initial score obtained in a subject: 12 (CF), aged 58, retired**.**

In the comparative analysis between groups, the effect size index (0.336) shows a small difference in favor of group E (a lower level of stress in group E).

Reducing the level of stress in experimental group subjects gives the respiratory physical therapy program a psychotherapeutic role in the case of those with essential hypertension and turns it into a means of combating stress.

Conclusions

1. Respiratory physical therapy, by conf rming the hypothesis of our research, is a means of f ghting stress present in hypertensive subjects. This effect is ref ected in a good functioning of all systems, predominantly the cardiovascular and respiratory systems.

2. Exhaustive and deep breathing exercises lead to general relaxation by decreasing muscle tone during expiration due to activation of the parasympathetic nervous system.

3. Inclusion of diaphragmatic breathing in both respiratory kinetic and daily activities contributes to the control of the heart and respiratory rate, allows for the f exibility of the trunk muscles by contraction-relaxation alternation, and optimizes the level of stress.

4. Personalized, controlled and systemic application of respiratory physical therapy reduces the stress level in hypertensive individuals and thus improves the quality of their lives.

Conf icts of interests
There are no conf icts of interests.

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Is there a relationship between f exibility ability and the selected long jump performance components of teenage athletes?

Există o relație între capacitatea de f exibilitate și componentele de performanță selectate ale sariturii in lungime la tinerii sportivi?

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Abstract

Background. The long jump is technically divided into four stages: run-up, jump, f ight and landing. The total measured distance of the long jump consists of the sum of these three lengths: take-off distance (L1), f ight distance (L2) and landing distance (L3). The parts of the long jump were examined to determine by analyzing the various kinematic variables such as the percentage of L1, L2 and L3 rates in previous studies.

Aims. The aim of this study was to determine whether there is a relationship between f exibility ability and selected variables of long jump performance components, particularly the landing distance (L3) for teenage athletes.

Methods. The research group comprised 32 male athletes, age 16.2 ± 0.6 years, who participated in the qualif cation round in the Turkey Youth Indoor Championships. All trials of the athletes were recorded and a two-dimensional analysis of their best performances was made. Velocity values (V10) of the last 10 meters of the approach run of the athletes, contact time at take-off, take-off angle, and long jump performance component (L1, L2, L3) values were calculated.

Result. When the relationship between the f exibility ability and other performance components of the athletes was examined, only a weak statistically signif cant correlation was found between the approach run velocity and f exibility (r=0.45). Various studies have been conducted in different events, examining the effects of f exibility on sprint and jumping ability.

Conclusions. Due to the L3 similarity of the body position in landing with the sit & reach test, the anticipated relationships were not found except for V10.

Keywords: flexibility, long jump, L3, teenage athlete.

Rezumat

Premize. Săritura in lungime este tehnic împărțită în patru etape: elanul, desprinderea, zborul și aterizarea. Distanța totală măsurată a săriturii în lungime reprezintă suma a trei lungimi: distanța de elan (L1), distanța de zbor (L2) și distanța de aterizare (L3). În studii anterioare, fazele săriturii în lungime au fost examinate pentru a determina valorile procentuale ale ratelor L1, L2 și L3 prin analizarea diferitelor variabile cinematice.

Obiective. Scopul acestui studiu a fost de a determina dacă există o relație între capacitatea de f exibilitate și variabilele selectate ale componentelor de performanță ale săriturii în lungime, în special distanța de aterizare (L3) pentru sportivii tineri.

Metode. Grupul de cercetare a fost format din 32 de sportivi de sex masculin, cu vârsta 16,2 ± 0,6 ani, care au participat la runda de calif care a Campionatului Indoor de Tineret, Turcia. Toate încercările sportivilor au fost înregistrate și a fost făcută o analiză bidimensională a celor mai bune performanțe. Au fost calculate valorile vitezelor (V10) pe ultimii 10 metri de abordare a săriturii în lungime, timpul de contact la bătaie, unghiul de desprindere și valorile componentelor de performanță pentru săritura în lungime (L1, L2, L3).

Rezultate. Atunci când s-au examinat relațiile dintre capacitatea de f exibilitate și celelalte componente ale performanței sportivilor, s-a constatat o corelație semnif cativă statistic între viteza de deplasare și f exibilitate (r = 0,45). Diverse studii au fost realizate cu ocazia diferitelor evenimente, examinând efectele f exibilității asupra abilităților de sprint și săritură.

Concluzii. Datorită asemănării L3 a poziției corpului în aterizare cu testul sit & reach, relațiile așteptate nu au fost găsite decât în cazul V10.

Cuvinte cheie: f exibilitate, săritura în lungime, L3, viteza de deplasare.

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Introduction

The long jump is one of the natural but technically complex disciplines of athletics. It primarily consists of an approach run at maximum speed and a f ight phase starting as close as possible to the jump line. To be successful in this event, the long jumper must have the ability of a sprinter so that it can reach a suff cient speed in the approach run. One of the most important factors affecting performance in the long jump is the speed of the approach run (Theodorou et al., 2017). Another important factor determining the jump distance in a long jump is the vertical movement of the horizontal velocity of the center of gravity of the body via the approach run applied at high speed, at the instant of touchdown at the take-off board (Koyama et al., 2006). After Bob Beamon's record in Mexico in 1968, a lot of work has been done on the biomechanics of the long jump. These studies have shown that good long jump performance can be described as a fast approach run and a skill of vertical transfer of the horizontally achieved velocity. However, arm movements also play an important role in the effectiveness of the vertical jump (Pradon et al., 2014). There are different techniques for transferring horizontal velocity to the vertical axis (Bridgett & Linthorne, 2006).

The long jump is technically divided into 4 phases: 1) Approach Run, 2) Jump, 3) Flight and 4) Landing. In a study investigating the ratio of total distance performance to jump phases for the long jump, 5.4% for jump (L1), 92.9% for f ight (L2) and 8.0% for landing (L3) were found (Hay et al., 1986). The landing phase of the long jump technique (L3) recalls the movement in the sit and reach test, which is often used for f exibility in athletic performance tests.

The sit and reach test is one of the most commonly used tests of f exibility in determining physical f tness parameters. It was designed in 1952 to measure back and lower extremity f exibility. In 2008, f exibility was def ned as the ability to move smoothly in the range of motion of the joint. Studies have shown that the sit and reach test can be used to measure the strength of the agonist muscle group and to determine the f exibility resistance of antagonist muscles. In 1966, it was reported that the sit and reach test was the most valid test compared to others for determining the folding f exibility of the torso (Carrasco et al., 2013).

The relationship between the level of f exibility and performance has always been the subject of research. In general, f exibility exercises are evaluated as a very important exercise that is applied with warming movements before training, providing many benef ts such as protection from injury and increase of performance by increasing body heat and nerve conduction. For this reason, it is necessary for athletes to perform f exibility exercises at the beginning of training. Although the effects of static and dynamic f exibility exercises have been discussed, many studies have demonstrated the positive contributions of f exibility exercises to performance (Paradisis et al., 2014). Dynamic f exibility exercises particularly have a great contribution to the development of power, speed and jumping abilities. In the development of the level of f exibility in general, static f exibility exercises were found to be more successful than dynamic f exibility exercises, based on the results of the sit and reach test (Samso et al., 2012).

The relationship between f exibility and performance has been constantly researched and the positive impact of f exibility on performance, especially the positive impact on speed and jumping, has been explained. Technically, there is a similarity between the positions of long jumpers in the landing phase and the body position in the sit-and-reach f exibility test. The purpose of this study was to determine whether there is a relationship between the f exibility ability and selected variables of long jump performance components, particularly the landing distance (L3), for young athletes.

Hypothesis

In the long jump, due to the L3 similarity of the body position in landing with the sit & reach test (L3), there may be a relationship between the f exibility ability of athletes and L3 percentage. Also, there may be a relationship between f exibility and the other long jump components such as run-up, contact time at take-off, take-off angle and percentage of jump phases.

Material and methods

Research protocol

All trials of the athletes in the research group were recorded during the Turkish Indoor Youth Championship. All trials of the athletes were recorded and two-dimensional analysis of their best performances was done.

a) Period and place of the research

The study included 32 male long jumpers competing in the Turkish Indoor Youth Championship organized in January 2015.

b) Subjects and groups

The subjects of the study, 32 male long jumpers, participated as volunteers in this study. They were informed in detail about the test procedures and benef ts of the results. The study was performed in accordance with the Declaration of Helsinki. The data collection process started after the approval of the Turkish Athletic Federation was obtained. The general characteristics of the participants are shown in Table I.

Table I

Athletes' age, body mass, height, and sitting height variables

Variables	n	Mean	SD
Age (years)	32	16.2	0.6
BM (kg)		62.8	7.2
BH (cm)		173.4	6.3
SH (cm)		90.41	3.60

Legend

BM: body mass, BH: body height, SH: sitting height

c) Tests applied

All trials of the athletes in the research group were recorded by a camcorder at 100 fps (Panasonic HC-w850). The camera was placed perpendicular to the take-off board. The photocells, which were used to determine the running times of athletes, were placed at 1m and 11m distance from the take-off board (Smart Speed, Fusion Sport, Australia). Velocities for the 11m-1m sections 10m (V10) were calculated for each jump. The off cial jump distances were recorded. The best performances of the athletes were

analyzed by two-dimensional analysis software (Tracker, v4.90-95). Thus, values of kinematic variables, which are loss of take-off (TO), duration of the contact of take-off (CT-TO), angle of take-off (TO-angle), take-off distance (L1), f ight distance (L2), and landing distance (L3) were obtained. Furthermore, the actual distance (sum of off cial distance and loss of TO) and percentages of L1, L2, and L3 were calculated.

d) Statistical processing

Pearson's correlation coeff cients (r) were used to express the relationships between parameters. Interpretation of correlation coeff cients was as follows: $r \leq 0.49$ weak relationship; $0.50 \leq r \leq 0.74$ moderate relationship; and $r \geq 0.75$ strong relationship. For the statistical procedure, the IBM-SPSS 20.0 pocket software was used and statistical signif cance was set at $p<0.05$. The general characteristics of the participants were presented as means and standard deviations (±SD).

Results

The demographic and anthropometric features of the athletes are presented in Table II.

Table II

Descriptive values (mean ± SD) of the long jumpers

Variables	n	Mean	SD
Off cial distance	32	5.44	0.67
Actual distance		5.58	0.63
Loss of TO		0.14	0.12
Flexibility (cm)		43.94	5.64
V10 (m/s)		8.25	0.51
CT-TO (s)		0.14	0.02
TO-angle (º)		19.02	3.73
L1 (%)		6.81	1.78
L2 (%)		83.23	3.82
L3 (%)		9.97	2.86

Pearson's correlation coeff cients were used to express the relationships between the f exibility ability and the selected variables of the long jumpers. These results are presented in Table III. According to these f ndings, there is a weak signif cant relationship between f exibility and V10 ($r=0.45$; $p<0.05$). No statistically signif cant relationship was found between f exibility and other variables, especially the landing distance (L3) ($p>0.05$).

Discussion

In the study, the relationships between the athletes' f exibility and the running speed (V10), the contact time (CT-TO), the take-off (L1), the f ight (L2) and the landing (L3) sections among the selected long jump performance components were investigated.

Many studies have looked at the relationship between f exibility characteristics and performance of athletes. In a study conducted to investigate the effect of static and dynamic f exibility exercises on the jump height, both f exibility exercises were found to improve the jump height (Samson et al., 2012).

In a study investigating the relationship between f exibility and reaction time, it was shown that although there is no signif cant difference between static and dynamic f exibility exercises, the increase in the level of f exibility results in a statistically signif cant difference of the reaction time when compared to the group that did not do any f exibility exercises (Perrier et al., 2011).

In a study conducted on long distance runners, an inverse relationship between the sit and reach f exibility test and running economy was found. That is, less f exible runners had higher running economies and this was statistically signif cant (Jones, 2002; Trehearn & Buresh, 2009). In another study on female runners with a mean age of 30 (± 9) years, it was found that the level of f exibility did not contribute to running economy (Mojock et al., 2011).

In a study on high-level footballers with a mean age of 16.1 (± 0.6), the relationship between f exibility development and performance was examined. In this study, it was found that the development of f exibility resulted in a signif cant improvement in footballers' 35m sprint values, explosiveness and agility (Hadjicharalambous, 2016). The 7-week f exibility exercise program applied to football players with a mean age of 16.5 (± 0.7) years resulted in a signif cant improvement in sprint values regardless of the position of the players (Fernandez et al., 2016).

In a study on the acute effect of static and dynamic f exibility exercises on the vertical jump performance of footballers, it was demonstrated that dynamic f exibility exercises had a more acute positive impact on vertical jump performance (Ferreira et al., 2013).

In a study on wrestlers, the effects of four weeks of dynamic f exibility exercises on performance were examined and signif cant improvements in anaerobic capacity and strength characteristics were obtained (Herman & Smith, 2008).

In a study on basketball players with a mean age of 20 (± 2) years, it was shown that the application of ballistic f exibility exercises and consequently, the development of f exibility provide a signif cant improvement in vertical jump performance (Woolstenhulme et al., 2006).

In a study on the f exibility level of footballers' hamstring muscles and its effect on football skills, it was found that less f exibility of back group muscles of the legs had an adverse effect on characteristics such as jump and speed. Based on this result, it was suggested that footballers should perform f exibility exercises at an early age (García-Pinillo et al., 2015).

Various studies have demonstrated that an increase

Table III

The relationships between the f exibility ability and the selected variables of the long jumpers.

Variables		Actual distance	V10	CT-TO	TO-angle	L1 (%)	L2 (%)	L3 (%)
Flexibility	r	0.34	0.45*	-0.14	-0.11	-0.04	0.05	-0.04
	p	0.55	0.01	0.46	0.56	0.82	0.80	.84

* $p<0.05$

in the f exibility of athletes results in an improvement of jumping and speed values. In this study, a statistically signif cant relationship between the approach run up speed, which is one of the long jump performance components, and the f exibility of the athletes was found, while there was no statistically signif cant relationship between the landing stage (L3) values of the athletes (due to the L3 similarity of the body position in the sit and reach f exibility test) and f exibility.

Conclusions

1. Due to the L3 similarity of the body position in landing with the sit & reach test, the anticipated relationships were not found except for V10.

2. A statistically signif cant weak positive correlation was found between the f exibility ability of the long jumpers in the study group and the approach run velocity (V10).

3. No statistically signif cant relationship was found between f exibility and other selected parameters. In the literature survey that was conducted, no other study examining the relationship between long jump performance components and f exibility was found.

Conf icts of interests

The authors conf rm that there are no known conf icts of interest associated with this publication.

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Improving balance by experimenting through animal-assisted therapies

Îmbunătăţirea echilibrului prin experimentarea unor terapii asistate de animale

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Abstract

Background. By combining two types of assisted therapies with horses and dogs, we believe that greater progress will be made in rehabilitating the balance compared to participating in a dog only- assisted therapy program.

Aims. The aim of the research is to assess the eff ciency of implementation of animal-assisted therapy programs in order to improve the static and dynamic balance of children with neuromotor disabilities.

Methods. A prospective study for a period of three months included two groups of 7 children each with neuromotor impairments, age 5-7 years. The experimental group followed a dog and horse-assisted therapy program, and the control group a dog only-assisted program. Two sections of the Tinetti test were applied to assess the static and the standing balance. The main statistical indicators using SPSS 20. were: mean, standard deviation (SD), mean difference (MD), Z score. For the comparison of two groups we used: the t-test and the paired Wilcoxon test.

Results. The difference between the static balance tests in the Tinetti test: experimental group MD 1.23 ± 1.23, control group MD 0.61 ±1.12. Cohen's effect size was d = 0.98 for the experimental group, which means a large effect, and d = 0.54 for the control group, meaning a medium effect size. When testing the standing balance in the Tinetti test: the experiment group MD 1.40 ± 1.19, the control group MD 0.06 ± 0.88; Cohen's effect size was d = 1.17 for the experimental group, which means a very large effect and d = 0.07 for the control group, which means a very small effect size.

Conclusions. The animal-assisted therapy with dogs and horses increased the ability of children's balance with neuromotor def ciencies because they tried to change their behavior and participate more actively in the treatment process. In both Tinetti static and standing tests, the experimental group made statistically signif cant improvements between the two tests, for p <0.05.

Keywords: balance, dog therapy, horse therapy, motor impairments, children.

Rezumat

Premize. Prin combinarea a două tipuri de terapii asistate cu cai şi câini, considerăm că se va realiza un progres sporit în ceea ce priveşte reabilitarea echilibrului comparativ cu participarea doar la programul de terapie asistată cu câini.

Obiective. Scopul cercetării constă în evaluarea ef cienţei implementării unor programe terapeutice asistate de animale în vederea îmbunătăţirii echilibrului static şi dinamic al copiilor cu def cienţe neuromotorii.

Metode. Studiul prospectiv s-a desfăşurat pe o perioadă de 3 luni, incluzând două grupe cu câte 7 copii cu def cienţe neuromotorii, vârsta 5-7 ani. Grupa experiment a urmat un program de terapie asistată de câini şi cai, iar grupa de control un program asistat doar de câini. Au fost aplicate două variante ale testului Tinetti pentru evaluarea echilibrului din aşezat şi ortostatism. Principalii indicatori statistici cu ajutorul programului SPSS 20. au fost: media, deviaţia standard (SD), diferenţa dintre medii (MD), scorul Z. Pentru compararea a două grupe, am utilizat: testul t şi testul Wilcoxon pentru eşantioane pereche.

Rezultate. Diferenţa dintre testări privind echilibrul din aşezat la testul Tinetti: grupa experiment MD 1,23 ± 1,23, grupa de control MD 0,61 ± 1,12. Mărimea efectului Cohen a fost d = 0.98 pentru grupa experiment, o mărime mare a efectului, şi d = 0,54 pentru grupa de control, o mărime medie a efectului. La testarea echilibrului din ortostatism prin testul Tinetti: grupa experiment MD 1,40 ± 1,19, grupa de control MD 0,06 ± 0,88; mărimea efectului Cohen a fost d = 1,17 pentru grupa experiment, o mărime foarte mare a efectului şi d = 0,07 pentru grupa de control, o mărime foarte mică a efectului.

Concluzii. Terapia asistată de animale precum câinii şi caii a determinat creşterea capacităţii de echilibru la copiii cu def cienţe neuromotorii, dat f ind că aceştia încearcă să-şi modif ce comportamentul şi să participe mai activ la procesul terapeutic. La ambele teste Tinetti din aşezat şi ortostatism, grupa experiment a înregistat progrese semnif cative statistic între cele două testări, pentru p<0,05.

Cuvinte cheie: echilibru, terapie cu câini, terapie cu cai, def cienţe motorii, copii.

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Introduction

Animal-assisted therapies (AAT) are aimed at improving physical, cognitive, behavioral, psychosocial, emotional and linguistic aspects of various categories of subjects of different ages, with different physical, neuromotor mental disorders, etc., as a result of the interaction with animals. AAT can be performed individually or in a group, and physical benef ts are directed to f ne and gross motricity and to improved balance and postural control.

Animal-assisted therapies (AAT) allow to benef t from animal companionship during a targeted therapy, to achieve optimal results in patients, and to support therapy. They provide positive effects, such as adapting to stressful situations and hospital environments; decreasing anxiety, stress, pain and blood pressure; and increasing mobility and muscle activity (Elmacı & Cevizci, 2015).

In animal-assisted interventions (AAIs), animals are used as adjuncts to therapy to positively affect human health. Research into the effects of animal-assisted interventions (AAIs) has primarily addressed human health outcomes (Glenk, 2017).

An AAI refers to a goal-directed intervention in which an animal meeting specif c criteria is an integral part of a treatment that assists in the healing process and rehabilitation of children with acute or chronic diseases (Rothe et al., 2005; Martin & Farnum, 2002). A variety of activities, such as caring for the animal, knowledge and games are included in a typical AAI session (O'Haire, 2013).

Animal interventions have been studied for various pathologies in children (Fabrizio et al., 2016; O'Haire, 2013; Bass et al., 2009; Dimitrijević, 2009; Schaefer, 2002) and in terms of satisfaction after the intervention and its effects on psychosocial behaviors (Stern & Konno, 2011; Souter & Miller, 2007). Constant adjustment to the horse movement stimulates muscle relaxation and thus encourages supportive, straightening and balance responses, facilitating movement. Hippotherapy provides sensory integration of kinesthetic, visual and vestibular inf uxes that are important for the development of postural and balance control (Zbornik, 2010).

Dogs, cats, horses, birds and toy animals are most often used in therapy. Animals are also used for the treatment of children with special needs. Interacting with a dog and other furry animals has a very positive effect on their quality of life (Dimitrijević, 2009). Although dogs are the most commonly used, all species can be employed (Fabrizio et al., 2016).

Equine-assisted therapy (EAT), hippotherapy, is a physical treatment strategy in which children with or without motor diff culties perform activities on and alongside a horse with the goal of using equine movements to improve balance, posture, gross and f ne motor skills (Snider et al., 2007). Snider et al. (2007) state that the warmth, shape and rhythmical three-dimensional movements of the horse improve the f exibility, posture, balance and mobility of the rider. In addition, EAT provides a multisensory environment that will prove benef cial for children with profound social and communication def cits (Bass et al., 2009).

Equine-facilitated psychotherapy is a developing form of animal-assisted therapy, which primarily incorporates human interaction with horses as guides. Benef cial results of a child-horse relationship include care translation, socialization and conversation, self-esteem promotion, companionship and affection stimulation (Rothe et al., 2005).

The aim of the research is to evaluate the eff ciency of the implementation of animal-assisted therapeutic programs in order to improve the static and dynamic balance of children with neuromotor def ciencies. By combining two types of assisted therapies with horses and dogs, we believe that increased progress will be made in improving the balance of participants in the study compared to the participation in a dog only-assisted therapy program.

Materials and methods

Research protocol

The specialized staff, as well as the companions, instructors and owners of the animals voluntarily participated in the study. Participation in the test was voluntary, and all the parents of the participants signed an informed consent form. The study was carried out according to the principles of the Declaration of Helsinki and was approved by the Ethics Committee of the university.

In the case of hippotherapy, sessions were individual, 30 minutes for each child, once a week, and in the case of dog-assisted therapy, sessions lasted for about one hour, once a week, time being organized in such a way that everyone could get in touch with the animal.

The dog-assisted therapy program consisted of different routes, obstacles, relays, team games, races, tailored according to each individual's ability, with gradually increasing diff culty from one session to another. The hippotherapy program focused on three types of patient activities: active - consisting of performing various horse exercises meant to improve the body›s posture, passive - in which the horse was moving and the patient had to adapt with the help of balance and coordination to the different categories of horse gaits such as gallop, trot and walk, and the most diff cult one, in which both the rider and the horse were moving.

a) Period and place of the research

This was a longitudinal, prospective study over a period of three months February - May 2017, and the locations of the interventions were: the Alpha Transilvana Foundation in Targu Mures for dog-assisted therapy, the Maltese Special Kindergarten in Cluj-Napoca for dog-assisted therapy, and the Equine and Hippotherapy Center in Reghin. The initial evaluation (T1) was conducted between February 10-25, 2017, and the f nal evaluation (T2) took place on 12.05.2017.

b) Subjects and groups

The study was attended by 14 children, of which seven attended the dog-assisted therapy program and formed group II, and 7 attended both programs (hippotherapy and dog-assisted therapy), forming group I. Inclusion criteria: children with neuromotor def ciencies with a mean age ± SD 6.14 ± 1.19 years were selected, having their parents' consent to participate in the AAT. Exclusion criteria: the children›s refusal to have a contact with the animal due to

fear or lack of interest.

The characteristics of the experimental group subjects (according to medical records) who attended the combined dog and horse therapy program were (name initials, year of birth, sex, diagnosis): DK (2011, female), retardation of mental and language development, autistic spectrum disorders under observation, psychomotor instability with attention def cit, hyperkinetics; GHN (2011, male), moderate retardation of mental and language development and atypical features; KAK (2010, male), severe retardation of speech development, sequelae of infantile encephalopathy of mixed type, f accid paraparesis/ paraplegia in cerebellar syndrome, autistic syndrome, moderate retardation of motor development; TM (2010, female), symptomatic epilepsy, complex focal seizures, severe mental and language retardation with autistic elements, hyperkinetic disorder with seizures, sequelae of infantile encephalopathy with f accid paraparesis/ paraplegia, cerebellar syndrome; MDA (2010, female), global motor development disorder of central origin, mixed development retardation, febrile seizures/ convulsions, acute unstable angina; DSS (2010, male), mixed development retardation, cri du chat syndrome, f accid tetraplegia; VD (2010, male), spastic quadriplegia, language and communication disorders.

The characteristics of the control group subjects (according to medical records) who attended the dog therapy program were (name initials, year of birth, sex, diagnosis): NB (2011, male), severe psychomotor retardation; RD (2009, female), cerebellar syndrome, f accid tetraplegia, moderate psychomotor retardation; CF (2011, female), f accid tetraplegia, overweight, epilepsy, moderate psychomotor retardation; MC (2011, male), right hemiparesis, strabismus; DI (2011, male), severe mental retardation, hyperopia; CC (2010, female), Down syndrome; IA (2010), moderate psychomotor retardation.

c) Tests applied

Two sections of the Tinetti test (Tinetti et al., 1986), including items described in Tables I and III, were applied to assess the static balance (on a seat without a backrest) and the standing balance (supervised by the examiner). Test evaluation scores: 0 pts - impossible to achieve, 1 pt for high-diff culty movement, 2 pts for low-diff culty movement, 3 pts for movement without diff culty.

d) Statistical processing

The data were processed using IBM-SPSS 18, 2010. The main statistical indicators were: mean, standard deviation (SD), mean difference (MD), Z score. Descriptive statistics (mean ± SD) was calculated for all coordinate variables. The value of statistical signif cance was set at $p < 0.05$. For the comparison of two groups we used the t-test and the paired Wilcoxon test.

Results

The differences using the Tinetti balance test are shown in Tables I and II: the experimental group MD 1.23 ± 1.23, and the control group MD 0.61 ± 1.12. Cohen›s effect size was d = 0.98 for the experimental group, which means a large effect size, and d = 0.54 for the control group, which means a medium effect size. The difference between pre-test and post-test values was statistically signif cant for the experimental group (z = 2.588, *p* 0.010), but for the control group the difference was not statistically signif cant (z = 1.807, *p* 0.071).

Table I

Mean and SD of items of the Tinetti test for the sitting balance in both groups.

Items	Group I (equine + dog therapies)		Group II (dog therapy)	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
	Pre-test	Post-test	Pre-test	Post-test
1. Sitting balance is steady and safe without any support	20.00±.37	22.00±.08	21.00±.11	21.00±.01
2. Sternum push	19.00±.48	19.00±.48	20.00±.37	20.00±.37
3. Trunk rotation/turn	20.00±.37	21.00±.24	17.00±.78	19.00±.48
4. Collecting (lifting) an object on the ground	18.00±.53	19.00±.48	17.00±.78	16.00±.75
5. Eyes closed - 15 sec.	17.00±.53	21.00±.29	18.00±.53	18.00±.53
6. Flexion of upper limbs at 90 degrees and staying upright for 15 sec.	19.00±.48	21.00±.08	16.00±.48	18.00±.53
7. Stretching forward (cm)	19.00±.48	19.00±.48	19.00±..48	19.00±.48
8. Placing and keeping the foot on a small chair	18.00±.53	18.00±.53	16.00±.75	16.00±.48
9. Throwing the ball/catching the ball	15.00±.69	17.00±.53	11.00±.53	11.00±.53
10. Rise from sitting	18.00±.78	18.00±.78	14.00±.81	15.00±.69
11. Trunk hyperextension (cm)	18.00±.78	20.00±.37	16.00±.75	19.00±.48
12. Lateral tilt of the torso (by pressing the elbow against a support)	18.00±.53	20.00±.37	17.00±.53	18.00±.53
13. Sitting on various unstable objects (bobath ball, water mattress, wheelchair, balance plate)	14.00±.57	14.00±.57	14.00±.57	14.00±.57

Table II

Descriptive analysis of differences between pre-test and post-test values in the experimental and control groups by the Tinetti test - sitting balance

Groups	Tests	Mean ±SD	Paired t-test		Paired Wilcoxon	
			t	p	Z score	p
Group I	Pre-test Post-test	17.92±1.75 19.15±2.11	3.593	.004	2.588[b]	.010
Group II	Pre-test Post-test	16.61±2.66 17.23±2.74	1.979	.071	1.807[b]	.071

b. - based on negative ranks; p<0.05

Tables III and IV highlight the differences between the results obtained for the standing balance - Tinetti test, as follows: for the experimental group MD 1.40 ± 1.19, and for the control group MD 0.06 ± 0.88. Cohen›s effect size was d = 1.17 for the experimental group, a very large effect size, and d = 0.07 for the control group, a very small effect size. The difference between pre- and post-test values was statistically signif cant for the experimental group, which was revealed using the Wilcoxon signed rank test for two paired samples (z = 3.104, *p* 0.002), but for the control group the difference was not statistically signif cant (z = 0.302, *p* 0.763).

Discussions

In both Tinetti tests - sitting and standing, the experimental group made statistically signif cant improvements between the two testings, but in the control group differences were statistically insignif cant between tests, p <0.05.

Research over the past 30 years indicates that therapy dogs may offer physiological, emotional, social, and physical support to children (Friesen, 2010).

Various approaches exist for improving postural control and balance through AAT (Zadnikar & Kastrin, 2011; Shurtleff, 2009; Hamill et al., 2007; Benda et al., 2003).

Hippotherapy - performing exercises on the back of an unsaddled horse (trunk straightening, rotation) helps improve numerous motor functions (Zadnikar, 2010).

The results of the study conducted in children aged 7-9 years with autism suggested that an EAT intervention may be benef cial to improve the balance, upper limb coordination and possibly strength of children with ASD in a way that is acceptable but also enjoyable to these children (De Milander et al., 2016).

A round therapy f eld 20 meters in diameter is recommended in horse therapy, where the patient, the therapist and the horse are in uninterrupted interaction. Such therapeutic sessions are practiced 2 to 3 times per week (Yeh, 2005).

Vidrine et al. (2002) summarize three studies using therapy with horses. One study in children with special educational needs showed an increase in positive behavior among the study participants.

During the past century, horses have been used in programs helping people with physical disabilities. Riders benef t from the gentle rocking motion that can help to relax muscles and improve balance. Some theorists contend that the horse power and size provide opportunities for riders to explore issues related to vulnerability, power, and control (Lentini & Knox, 2009).

Some studies concluded that equine-facilitated psychotherapy provides well-being and an improvement in the quality of life of children with mental health problems; horses can put children therapeutically in touch with their own vitality by their large and gentle presence (Rothe et al., 2005).

Conclusions

1. Dog and horse-assisted therapy increased the abilities of children with neuromotor def ciencies, because they tried to change their behavior and participate more actively in the treatment process.
2. AAT contributed to the improvement of the static

Table III

Mean and SD of items of the Tinetti test for the standing balance in both groups.

Items	Group I (equine + dog therapies)		Group II (dog therapy)	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
	Pre-test	Post-test	Pre-test	Post-test
1. Sitting balance is steady and safe without any support	19.00±.48	20.00±.37	19.00±.48	20.00±.65
2. Sternum push	17.00±.78	17.00±.78	17.00±.53	16.00±.48
3. Trunk rotation/turn	19.00±.48	18.00±.53	18.00±.53	17.00±.53
4. Collecting (lifting) an object on the ground	17.00±.78	18.00±.53	19.00±.48	14.00±.89
5. Eyes closed - 15 sec.	15.00±.37	17.00±.69	13.00±.69	14.00±.53
6. Flexion of upper limbs at 90 degrees and staying upright for 15 sec.	16.00±.48	19.00±..34	15.00±.89	16.00±.53
7. Stretching forward (cm)	18.00±.78	20.00±.48	14.00±.48	14.00±.72
8. Placing and keeping the foot on a small chair	15.00±.69	16.00±.75	15.00±.89	12.00±.75
9. Throwing the ball/catching the ball	11.00±.97	14.00±.57	16.00±.48	16.00±.48
10. Standing on one foot	13.00±.37	15.00±.89	12.00±.49	12.00±.53
11. Stepping over obstacles	14.00±.57	16.00±.57	15.00±.38	15.00±.37
12. Walking on a drawn line	13.00±.37	14.00±.48	13.00±.37	12.00±.75
13. Moving hands and trunk while walking	14.00±1.00	15.00±.57	14.00±.57	13.00±.78
14. Climbing up and down stairs	17.00±.53	18.00±.53	16.00±.48	17.00±.53
15. Running	15.00±.89	17.00±.75	15.00±.89	16.00±.48

Table IV

Descriptive analysis of differences between pre-test and post-test values in the experimental and control groups by the Tinetti test - standing balance.

Groups	Tests	Mean ±SD	Paired t-test		Paired Wilcoxon	
			t	p	Z score	p
Group I	Pre-test Post-test	15.53±2.32 16.93±1.94	5.137	.000	3.104[b]	.002
Group II	Pre-test Post-test	15.40±2.13 15.46±2.19	.292	.774	.302[b]	.763

b. - based on negative ranks; p<0.05

and dynamic balance, the results being statistically signif - cant.

3. Regarding the improvement of the static and dynamic balance, the combined dog and horse-assisted therapy had superior effects compared to the horse only-assisted therapy.

Conf icts of interest

The authors have no conf ict of interest.

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The experimental effect of Lycium barbarum on redox homeostasis in physical exercise

Efectul experimental al Lycium barbarum asupra homeostaziei redox în efort f zic

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Abstract

Background. Goji has over 100 potentially benef cial constituents for the human body contained in all parts of the plant, especially in fruit and roots. Data from the literature have suggested benef cial effects on the human body after long-term Goji juice intake.

Aims. We studied the antioxidant effect of Lycium barbarum (Goji) natural juice on the body subjected to physical exercise.

Methods. The oxidant-antioxidant balance indicators were determined in 6 groups of male Wistar rats (n = 6 animals/group) which performed physical exercise through the swimming test. Some groups only performed physical exercise, while others were subjected to physical exercise and received an additional daily intake of Lycium barbarum natural juice. Nitro-oxidative stress was measured by serum determination of total oxidant status (TOS), total antioxidant capacity (TAC), malondialdehyde (MDA), total thiols, nitrites and nitrates.

Results. Increased TAC and serum thiol levels conf rmed the antioxidant potential of Lycium barbarum during physical exercise. The daily intake of Lycium barbarum natural juice led to the reduction of oxidative stress and, implicitly, of lipid peroxidation, as evidenced by the decrease of serum MDA values.

Conclusions. Under experimental conditions, the administration of natural Lycium barbarum juice was benef cial by increasing exercise capacity. Due to its energetic and antioxidant effect, Lycium barbarum could represent a natural, non-doping alternative for improving sports performance.

Keywords: Lycium barbarum (Goji), oxidant-antioxidant balance, physical exercise.

Rezumat

Premize. Goji are peste 100 de constituenţi cu potenţial benef c pentru organismul uman conţinuţi în toate părţile plantei, mai ales la nivelul fructului şi al rădăcinii. Date din literatură au sugerat existenţa unor efecte benef ce asupra organismului uman după consumul sucului de Goji pe termen lung.

Obiective. Am studiat efectul antioxidant al sucului natural de fructe Lycium barbarum (Goji) asupra organismului în efort f zic.

Metode. Au fost determinaţi indicatorii balanţei oxidanţi-antioxidanţi la 6 loturi de şobolani masculi rasa Wistar (n = 6 animale/lot) care au efectuat efort f zic prin proba de înot. Unele loturi au fost supuse doar efortului f zic prin proba de înot, iar celelalte au fost supuse efortului şi aportului suplimentar de Lycium barbarum. Stresul nitro-oxidativ a fost măsurat prin determinarea serică a statusului oxidativ total, a capacităţii antioxidante totale, a malondialdehidei şi a tiolilor totali.

Rezultate. Creşterea valorilor capacităţii antioxidante totale (TAC), a nivelului seric de tioli a conf rmat potenţialul antioxidant al Lycium barbarum în condiţii de efort f zic. Suplimentarea cu suc natural de Lycium barbarum a condus la diminuarea stresului oxidativ şi, implicit, a peroxidării lipidice, dovedite prin scăderea valorilor malondialdehidei serice.

Concluzii. În condiţii experimentale, administrarea sucului natural de Lycium barbarum şi-a adus aportul benef c la creşterea capacităţii de efort. Datorită efectului energogen şi antioxidant în condiţii de efort, Lycium barbarum ar putea reprezenta o alternativă naturală, nedopantă, pentru îmbunătăţirea performanţelor sportive.

Cuvinte cheie: Lycium barbarum (Goji), balanţă oxidanţi/antioxidanţi, efort f zic.

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Introduction

Goji was named Lycium barba rum in the botanical nomenclature in 1753 (Carl Linnaeus) (Kulczyński & Gramza-Michałowska, 2016). It belongs to the Solanaceae family, Lycium genus (Ma et al., 2009). Although it is known in the literature under many names, the name Goji derived from the Chinese "gouqi" has been widely accepted (Hänsel et al., 1993).

Goji is a shrub with reddish-orange fruits, having a diameter of 1-2 cm^2 and bitter-sweet taste (Zhang et al., 2001).

Goji has over 100 potentially benef cial constituents for the human body contained in all parts of the plant, especially in fruit and roots. Through these constituents, *Lycium barbarum* exhibits a powerful antioxidant and cytoprotective effect: hypoglycemic (Shaban et al., 1990; Wu et al., 2006), hypolipemic (Zhao et al., 2005; Luo et al., 2004), cardio- (Xu et al., 2005), neuro- (Lin et al., 2003; Yu et al., 2006; Yu et al., 2007), pancreato- and hepatoprotective (Kim et al., 1997; Chin et al, 2003; Slemmer et al., 2008), anti-aging (Zhao et al., 2005; Li et al., 2007b), anti-arterial hypertension (Jia et al., 1998; Chan et al., 2007); it contributes to increasing the body's resistance to physical exercise, etc.

Goji fruits are consumed fresh or in the form of juice, tea (infusion) or wine (Zhufan, 2000). They can also be used in combination with conventional products such as yogurt or snacks with seeds, dehydrated fruits and oatmeal (Potterat, 2010) in various culinary preparations (Yin & Dang, 2008) or as seasonings (Jin et al., 2013). The recommended daily dose of dried Goji fruit is 5-12 g, calculated for an adult body (Bensky et al., 2004).

Hypothesis

The benef cial effects of Goji as well as its contribution to increased exercise capacity have led us to study the antioxidant effect of *Lycium barbarum* (Goji) natura l fruit juice on the body subjected to physical exercise through oxidative-antioxidant balance indicators.

Materials and methods

a) Research protocol

The experimental study was performed on 16 weeks old male Wistar rats, with a mean weight of 200 grams, from the Biobase of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca. The study was approved by the Ethics Board, according to Good Practice Guidelines. The requirements of the Helsinki Declaration, Amsterdam Protocol, Directive 86/609/EEC and the regulations of the Bioethics Commission of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca were met. All conditions for reducing the suffering of experimental animals and the principles of biodiversity were ensured by observing the provisions of the Government Ordinance no. 37 on the protection of laboratory animals.

The research was carried out in the Experimental Research Laboratory of the Pathophysiology Department of the "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca. During the experiment, the animals were maintained under appropriate vivarium conditions at a controlled temperature of 21-22 °C, 65% humidity, cycle light:dark 12:12 h, standardized feed and water ad libitum.

b) Groups

The measurements were performed in 6 groups of rats (n = 6 animals/group) that were subjected to physical exercise through the swimming test:

- group I - controls + exercise 1 day
- group II - controls + supplement + exercise 1 day
- group III - rats + exercise 7 days
- group IV - rats + daily supplement + exercise 7 days
- group V - rats + exercise 14 days
- group VI - rats + daily supplement + exercise 14 days.

The supplement was represented by 100% natural Lycium barbarum fruit juice, imported and distributed by SC Goji Planet SRL. The daily dose of Goji juice of 0.3 ml/animal/day was given by oropharyngeal gavage for 1 day, 1 or 2 weeks.

c) Tests applied

Oxidative stress was induced by physical exercise for 14 days using the swimming test according to the standardized model in the literature (Nayanatara et al., 2005). The aerobic exercise capacity (AEC) was determined by measuring the time, expressed in seconds, from the moment the animals were introduced into the pool until their exhaustion (refusal to swim). The intensity of exercise was changed by loading the animals in groups III-VI with lead weights accounting for 15% of the animal's weight.

The duration of the experiment was 14 days. The studied days were day 1 (T1), day 7 (T2) and day 14 (T3).

Biochemical determinations were performed in the Laboratory of the Pathophysiology Department of "Iuliu Haţieganu" University of Medicine and Pharmacy Cluj-Napoca. For the measurement of the indicators of the O/AO balance in the blood, venous blood samples were taken from the retro-orbital sinus, under general anesthesia with 2:1 10% ketamine and 2% xylazine. From the harvested blood, the serum was separated by centrifugation, in order to measure the indicators. Readings were made on the METERTEK SP-830 spectrophotometer. Animals were sacrif ced under general anesthesia by cervical dislocation at the end of the experiment.

The serum indicators determined were total oxidant status (TOS), total antioxidant capacity (TAC), malondialdehyde (MDA) and total thiols. MDA was determined by using the microanalytical method of Pasha and Sadasivadu (Mitev et al., 2010). For the determination of the total oxidant status (TOS) a spectrophotometric method was used (Ozcan, 2005). Determination of thiols was performed by the Ellman method (Mitev et al., 2010) and total antioxidant capacity (TAC) was determined by using the Fenton reaction (Ozcan, 2004).

d) Statistical processing

Descriptive statistics elements were calculated. Data were presented using centrality, location and distribution indicators.

Normal distribution was tested with the Shapiro-Wilk test. ANOVA, Kruskal-Wallis, t (Student), Mann-Whitney (U) and Wilcoxon tests were used for statistical data

processing. The signif cance threshold was α = 0.05, α = 0.01 or α = 0.001. For the correlation analysis, the Pearson (r) and Spearman (ρ) correlation coeff cients were used, and their interpretation was made according to Colton's empirical rules.

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

Results

a) The O/AO balance in the serum

The statistical analysis of total antioxidant capacity (TAC) showed very statistically signif cant differences between at least two groups (p <0.01) considering all groups, and highly statistically signif cant differences between at least two groups (p <0.001) considering the three groups with *Lycium barbarum* supplementation.

The statistical analysis of TAC values for unpaired samples evidenced:

- highly statistically signif cant differences between groups II-VI, V-VI (p <0.001)
- very statistically signif cant differences between groups IV-V (p <0.01)
- statistically signif cant differences between groups I-VI, II-IV (p <0.05).

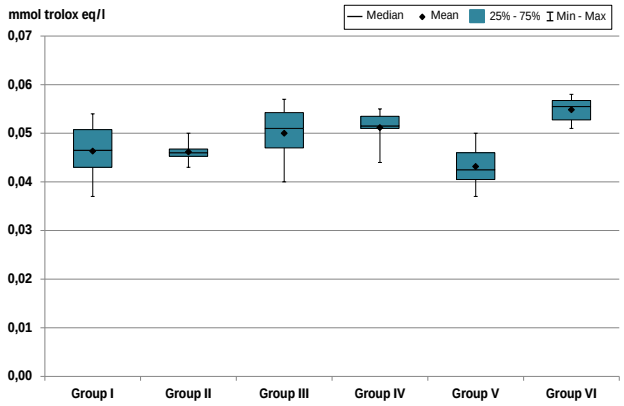

Fig. 1 – Serum TAC in the studied groups.

The statistical analysis of total oxidant status (TOS) showed statistically signif cant differences between at least two groups (p < 0.05) considering all groups, but no statistically signif cant differences between the groups (p > 0.05) considering the three groups with *Lycium barbarum* supplementation or the three groups without *Lycium barbarum* supplementation.

The statistical analysis of TOS values for unpaired samples evidenced:

- very statistically signif cant differences between groups I-VI (p < 0.01)
- statistically signif cant differences between groups V-VI (p < 0.05).

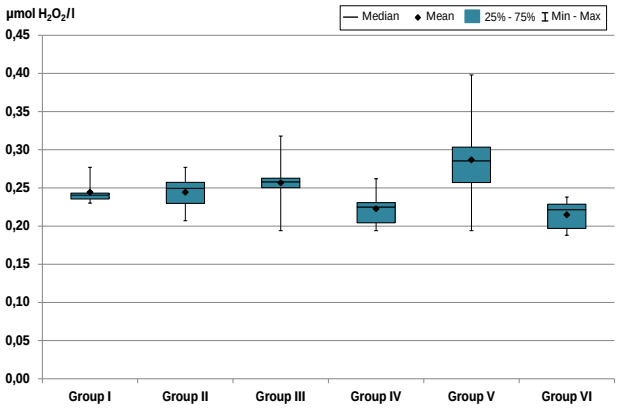

Fig. 2 – Serum TOS in the studied groups

The statistical analysis of thiol values showed no statistically signif cant differences between the groups (p > 0.05) when all the groups, the three groups with *Lycium barbarum* supplementation or the three groups without *Lycium barbarum* supplementation were considered. Contrary to expectations, the statistical analysis of thiol values for unpaired samples evidenced statistically signif cant differences between groups I-V and V-VI (p <0.05).

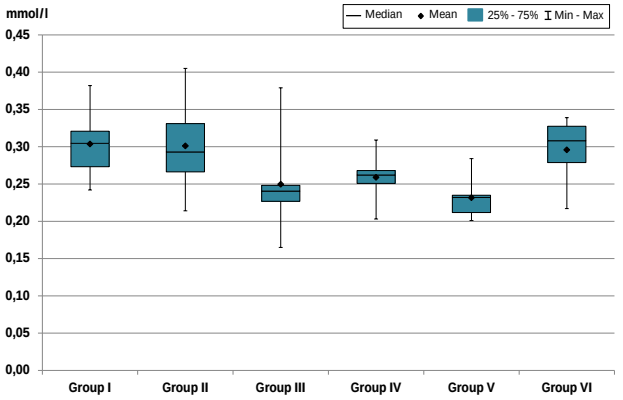

Fig. 3 – Serum thiols in the studied groups

The statistical analysis of MDA values showed statistically signif cant differences between at least two groups (p < 0.05) considering all groups, and statistically signif cant differences between at least two groups (p < 0.05) considering the three groups with *Lycium barbarum* supplementation.

The statistical analysis of MDA values for unpaired samples evidenced:

- highly statistically signif cant differences between groups II-VI, V-VI (p < 0.001)
- very statistically signif cant differences between groups I-VI (p < 0.01)
- statistically signif cant differences between groups I-V, III-VI (p < 0.05).

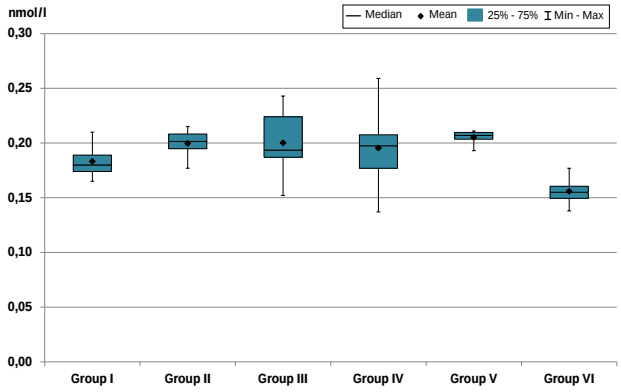

Fig. 4 – Serum MDA in the studied groups

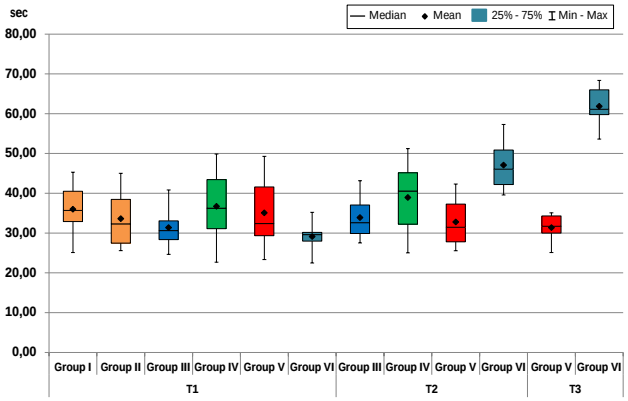

Fig. 5 – Aerobic exercise capacity in the studied groups

b) Aerobic exercise capacity (AEC)

The statistical analysis of AEC values at time T1 showed no statistically signif cant differences between the groups ($p > 0.05$) when all the groups, the three groups with *Lycium barbarum* supplementation or the three groups without *Lycium barbarum* supplementation were considered. The statistical analysis for unpaired samples at time T1 showed no statistically signif cant differences between the groups ($p > 0.05$).

The statistical analysis of AEC values at time T2 showed statistically signif cant differences between at least two groups ($p < 0.05$) considering all groups. The statistical analysis for unpaired samples at time T2 evidenced very statistically signif cant differences between groups III-VI, V-VI ($p < 0.01$).

The statistical analysis for unpaired samples of aerobic exercise capacity values at time T3 showed highly statistically signif cant differences between groups V-VI ($p < 0.001$).

The statistical analysis of AEC values, considering all three time points, evidenced highly statistically signif cant differences between at least two of the studied time points in group VI ($p < 0.001$), but no statistically signif cant differences were found between any of the three time points in group V ($p > 0.05$).

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

- in group III - very statistically signif cant differences between times T1-T2 ($p < 0.01$)
- in group VI - highly statistically signif cant differences between times T1-T2, T1-T3 and T2-T3 ($p < 0.001$).

c) Correlations between the values of O/AO balance indicators

For the groups without *Lycium barbarum* supplementation (I, III, V), the statistical analysis of correlation between the values of the studied indicators showed:

- in group I – very good positive correlations between thiols-MDA, very good negative correlations between TAC-TOS, and acceptable positive correlations between TAC-thiols, TOS-MDA
- in group III – very good positive correlations between TAC-MDA, very good negative correlations between TAC-thiols, good negative correlations between TOS-thiols, thiols-MDA, and acceptable positive correlations between TAC-TOS, TOS-MDA
- in group V – very good positive correlations between TAC, thiols, TAC-MDA, good negative correlations between TAC-TOS, TOS-thiols, acceptable negative correlations between TOS- MDA, and acceptable positive correlations between thiols-MDA.

For the groups with *Lycium barbarum* supplementation (II, IV, VI), the statistical analysis of correlation between the values of the studied indicators showed:

- in group II – good positive correlations between TAC-thiols, TAC-MDA, good negative correlations between TOS-MDA, and acceptable negative correlations between TAC-TOS
- in group IV – very good negative correlations between TOS-MDA and acceptable positive correlations between TOS-thiols
- in group VI – good positive correlations between TOS-MDA, good negative correlations between TAC-TOS, TOS-thiols, thiols-MDA, and acceptable negative correlations between TAC-thiols.

Table I

Statistical analysis of correlation between the values of the serum indicators of the O/AO balance.

Indicators		Group I		Group III		Group V		Group II		Group IV		Group VI	
TAC -	TOS	-0.9429	****	0.3198	**	-0.6821	***	-0.4838	**	-0.1804	*	-0.5618	***
	Thiols	0.3144	**	-0.8322	****	0.6270	***	0.7106	***	0.2066	*	-0.3362	**
	MDA	0.0315	*	0.8044	****	0.5564	***	0.6288	***	0.0783	*	0.1352	*
TOS -	Thiols	-0.1429	*	-0.5693	***	-0.5557	***	0.0128	*	0.4140	**	-0.5786	***
	MDA	0.3143	**	0.4131	**	-0.3219	**	-0.6237	***	-0.8989	****	0.5114	***
Thiols -	MDA	0.8690	****	-0.5453	***	0.2896	**	0.0139	*	-0.1504	*	-0.5966	***

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

d) Correlations between the values of the aerobic exercise capacity and those of the O/AO balance indicators

For the groups without *Lycium barbarum* supplementation (I, III, V), the statistical analysis of correlation between the values of the aerobic exercise capacity and the O/AO balance indicators showed:

- in group I – acceptable positive correlations with TOS
- in group III – acceptable positive correlations with TOS and acceptable negative correlations with thiols
- in group V – very good positive correlations with TAC and MDA, good positive correlations with thiols, and good negative correlations with TOS.

For the groups with *Lycium barbarum* supplementation (II, IV, VI), the statistical analysis of correlation between the values of the aerobic exercise capacity and the O/AO balance indicators showed:

- in group II – very good positive correlations with thiols, acceptable positive correlations with TAC, and acceptable negative correlations with MDA
- in group IV – very good positive correlations with MDA, good negative correlations with TOS, and acceptable positive correlations with thiols
- in group VI – acceptable negative correlations with MDA.

Discussions

Supplements with an antioxidant role have been promoted by manufacturers as means of improving the body's resistance to oxidative stress, of preventing and repairing oxidative lesions caused by excessive physical strain. Due to the fact that L. barbarum (Goji) is considered a remarkable antioxidant (Zhang, 2013), it has become an active substance with antioxidant role frequently incorporated in food supplements. A 30-day study on humans who consumed Goji juice demonstrated its increased antioxidant effect and suggested benef cial effects on the body in case of long-term consumption (Amagase et al., 2009).

Our results have shown that the administration of *Lycium barbarum* improves the total antioxidant capacity (TAC) after a period of physical exercise. Antioxidant effects were signif cantly improved under physical exercise conditions after antioxidant administration, both at half-time and at 14 days.

Signif cant differences were also observed in the total oxidant status (TOS). In animals that received Goji juice, TOS decreased after 14 days of exercise compared to the control group. Increased oxidative stress was evident in animals that performed physical exercise compared to those that received *Lycium barbarum* juice for 14 days and performed physical exercise under the same conditions as the f rst ones. Thus, *Lycium barbarum* had a benef cial effect on combating oxidative stress produced under exercise.

Thiols decreased signif cantly during the study period in animals that performed only physical exercise, the values being lower both at half-time and at the end of the study period compared to exercise-trained animals that received Goji supplements. Determination of serum thiols also highlighted the benef cial antioxidant effect of *Lycium barbarum* administered for 14 days during physical exercise, the values being signif cantly increased in comparison to those of animals subjected to the same conditions, without Goji supplementation.

An experimental study on rats looked at the oxidative stress caused by excessive exercise, by increasing MDA levels and serum creatine kinase activity and lowering glycogen levels and SOD and GPx activity. Lipid peroxidation causes increased membrane permeability, resulting in loss of cytosolic proteins. The administration of *L. barbarum* with a high content of polysaccharides improved muscle antioxidant activity (Niu et al., 2008).

Our data showed that MDA values after administration of *Lycium barbarum* natural juice and after 14 days of training were signif cantly lower compared to day 1 (regardless of whether or not Goji juice was administered), as well as to days 7 and 14 in the absence of Goji juice. Our results are in agreement with other studies, showing that high levels of MDA, which is one of the f nal degradation products in lipid peroxidation and is an important indicator of oxidative stress in cells and tissues, are associated with severe oxidative stress and increased lipid peroxidation, respectively (You et al., 2011).

In the literature, the effectiveness of *L. barbarum* was demonstrated in free radical uptake, in the inhibition of lipid peroxidation (Gao et al., 2010; Cheng & Kong, 2011; Yi et al., 2013), in the improvement of muscle fatigue and mitochondrial dysfunction. The protective effect of Goji was also revealed by the limitation of the increase of lipid peroxidation and the decrease of SOD and GSH-Px enzymes at muscle level (Kerr, 2010).

Pharmacological investigations on the antioxidant effect of *L. barbarum* mainly attributed this capacity to *L. barbarum* polysaccharides (LBP) (Li et al., 2007a; Li & Zhou, 2007), but also to other components such as f avonoids or carotenoids (Le et al., 2007; Jiang, 2014). The mechanism of action of both classes of compounds includes metal reducing and chelating capabilities, as well as the ability to clean free radicals (Li & Zhou, 2007).

A study conducted on mice trained for swimming

Table II

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

Indicators		Group I		Group III		Group V		Group II		Group IV		Group VI	
AEC -	TAC	-0.1612	*	-0.0605	*	0.9410	****	0.3541	**	-0.1300	*	0.1723	*
	TOS	0.3714	**	0.4630	**	-0.5676	***	-0.1547	*	-0.6336	***	-0.2344	*
	Thiols	0.2129	*	-0.2728	**	0.5217	***	0.7618	****	0.2737	**	0.0137	*
	MDA	-0.0542	*	0.2227	*	0.7758	****	-0.3736	**	0.8579	****	-0.3553	**

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

revealed the benef cial effect of *Lycium barbarum* polysaccharide content on muscle fatigue, by lowering lactate concentration and increasing glycogen concentration (Yao & Li, 2010).

Our data on exercise capacity showed that this increased signif cantly on day 7 in animals that swam and received Goji compared to those that were only subjected to physical exercise by swimming. The same situation was maintained at the end of the study period. Exercise capacity decreased in animals that swam for 14 days without Goji supplementation, but the differences were not signif cant between the three studied time moments. In animals that swam for 14 days and received Goji supplements, the exercise capacity increased, the differences being signif cant between the studied times.

Finally, the results of the correlation analysis between the studied O/AO balance indicators suggest that Goji administration improves the ability to combat oxidative stress under exercise. Also, the correlation of the O/AO balance with the aerobic exercise capacity demonstrated that in the Goji supplemented group, with the increase of the exercise capacity, the values of oxidative stress indicators decreased at the end of the experimental study.

Conclusions

1. The increase in the total antioxidant capacity (TAC) conf rmed the antioxidant potential of *Lycium barbarum* under physical exercise conditions.

2. The increase in serum thiol levels after supplementation with *Lycium barbarum* natural juice demonstrates the increase in the antioxidant capacity of the body under physical exercise conditions.

3. Supplementation with *Lycium barbarum* natural juice led to the reduction of oxidative stress and, implicitly, of lipid peroxidation, evidenced by the decrease of serum malondialdehyde values.

4. Administration of *Lycium barbarum* natural juice made a positive contribution to increasing exercise capacity.

5. Due to its energetic and antioxidant effect under physical exercise conditions, *Lycium barbarum* could be a natural, non-doping alternative for improving sports performance and post-exercise recovery.

Conf icts of interest

Nothing to declare.

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REVIEWS

Implications of rheumatology in sports medicine

Implicaţii ale reumatologiei în medicina sportivă

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Abstract

Rheumatology is the branch of medicine that studies, besides autoimmune diseases, musculoskeletal pathology as well. These conditions may occur as a consequence of practicing sports or other recreational activities which involve physical overload.

The ability of rheumatologists to recognize, investigate and treat musculoskeletal conditions makes rheumatology a discipline with important applications in sports medicine. Musculoskeletal ultrasound, considered to be "the rheumatologist's stethoscope", has many uses in sports medicine.

The most frequent rheumatologic conditions in sports medicine are periarticular conditions of the shoulder, elbow, hip, knee and leg, as well as arthrosis. These include aff ictions of the tendons, ligaments, bursae, joint capsule, cartilages, fasciae, muscles and peripheral nerves.

In most cases the diagnosis is clinical (+/- by ultrasound) and the treatment is conservative: pain control and rehabilitation treatment; sometimes periarticular inf ltrations or surgical interventions are also required.

Most musculoskeletal conditions linked to physical overload can be prevented by observance of rest intervals, the use of correct training techniques, as well as the use of adequate sports equipment.

Keywords: rheumatology changes, athletes, sports medicine.

Rezumat

Afecţiunile musculoscheletale pot apărea ca urmare a practicării unui sport sau a unor activităţi recreacţionale care implică suprasolicitare f zică.

Abilitatea reumatologilor de a recunoaşte, a investiga şi a trata afecţiunile musculoscheletale face ca reumatologia să aibă importante aplicaţii în medicina sportivă. Ecograf a musculoscheletală, considerată "stetoscopul reumatologului", are multe utilizări în medicina sportivă.

Cele mai frecvente afecţiuni reumatologice întâlnite în medicina sportivă sunt reprezentate atât de afecţiuni periarticulare ale umărului, cotului, şoldului, genunchiului şi piciorului, cât şi de boala artrozică. Acestea includ afecţiuni ale tendoanelor, ligamentelor, burselor, capsulei articulare, cartilajului, fasciilor, muşchilor şi nervilor periferici.

În majoritatea cazurilor diagnosticul este clinic (+/- ecograf c), iar tratamentul este conservator: controlul durerii şi tratament de reabilitare; uneori este nevoie şi de inf ltraţii periarticulare sau de intervenţie chirurgicală.

Majoritatea afecţiunilor musculoscheletale legate de suprasolicitare pot f prevenite prin respectarea perioadelor de odihnă şi repaus, folosirea tehnicilor corecte de antrenament, precum şi folosirea de echipament sportiv adecvat.

Cuvinte cheie: modif cări reumatologice, sportivi, medicină sportivă.

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Upper limb conditions

The shoulder is an extremely important joint judging by the high degree of movements it is capable to perform; it is the most mobile joint of the body, hence its high proneness to injury (Bojinca, 2007; Speed, 2005). Sports shoulder injuries occur in case of repeated arm above the head movements, as well as through direct trauma in contact sports. The main sports where shoulder injuries occur are: baseball, tennis, swimming, throwing, gymnastics and weight lifting (1); (Birkelo et al., 2003; Burkhartt et al., 2003; Seroyer et al., 2009; Bennett, 2012).

The main symptoms of shoulder injuries are pain and functional impotence. Generally, shoulder pain is a term used by patients not only for the joint per se, but also for a wide range of upper thorax and arm conditions. Joint swelling is usually diff cult to notice. Movement pain is one of the most important signs for this area (Bojinca, 2007); (2).

Rotator cuff lesions (tendons of the subscapularis, supraspinatus, infraspinatus and small round muscles) are the most common shoulder condition. These are tendinitis/ tendinosis, partial or total tendon ruptures. They occur due to the inf ammation and wear of the rotator cuff tendons, especially the supraspinatus tendon. They are often associated with subacromial bursitis (3); (Conway et al., 2001; Fleisig et al., 1998; Kuhn et al., 1998). Pain is felt in the deltoid region, is accentuated during the night and is associated with weakness in abduction and external rotation of the shoulder, with possible crepitus or even palpable defect in case of complete rupture. Rotator cuff tendinitis is characterized by the positive "painful arc sign": The patient is asked to raise the arm laterally from 0° to 180°, pain occurring during movement within the 45° angle above and below the horizontal shoulder plane, but also during internal rotation and abduction. The "drop-arm" test shows the incapacity to actively sustain the shoulder at a 90º angle and indicates complete rupture. Incomplete rupture has similar symptomatology to that of tendinitis (Bojinca, 2007).

Radiologically, the upper migration of the humeral head and narrowing of the acromiohumeral interval in case of rotator cuff rupture are highlighted. MRI and ultrasound examinations can identify both tendinitis and tendon ruptures (Bojinca, 2007; Meller et al., 2007).

Treatment is conservative: rest, pain killer/anti-inf ammatory medication, rehabilitation treatment; in case of tendon ruptures, surgical treatment is recommended. Injection of glucocorticoids in the subacromial bursa improves pain (Bojinca, 2007; Seroyer et al., 2009).

Subacromio-subdeltoid bursitis is usually associated with rotator cuff lesions, as a reactive process to it. Palpation of the deltoid area causes pain. Abduction of the arms at an over 90° angle, and especially abduction against resistance, causes intense pain (Bojinca, 2007). Ultrasound easily detects this condition. Treatment is conservative or local – inf ltrations with glucocorticoids +/- anesthetics (Seroyer et al., 2009).

Bicipital tendinitis affects the passing of the biceps long head tendon through the bicipital groove. Clinically, it is characterized by pain on the anterior side of the shoulder, irradiating to the biceps. The palpation of the tendon long head in the bicipital groove causes pain. It can occur at the same time as rotator cuff lesions. Shoulder f exion against resistance with extended elbow (Speed test), active supination of the forearm against resistance with the elbow bent at a 90º angle (Yergason test), lifting the arms over the head with interlaced f ngers and active arm abduction (Ludlington test) all cause pain (Bojinca, 2007). Diagnosis is clinical +/- by ultrasound, and treatment is conservative. The local injection of glucocorticoids runs the risk of iatrogenic tendon rupture (Bojinca, 2007; Seroyer et al., 2009).

Other shoulder conditions linked to physical overload are calcif c tendinitis, rupture of the articular labrum, glenohumeral instability (subluxation) (Seroyer et al., 2009).

Elbow lesions occur in sports that involve repetitive use of the forearm muscles, such as tennis, golf, and throwing moves. These are lateral epicondylitis, medial epicondylitis and olecranon bursitis (posttraumatic) (Luria & Chu, 2014; Bennett, 2012).

Lateral epicondylitis ("tennis elbow"/tennis player epicondylitis) is mostly due to the damage of the tendon of the extensor carpi radialis brevis muscle. It occurs in athletes who intensively use their forearms in racket sports or sports involving throwing movements with arms above the head. It causes pain in the lateral epicondyle at local pressure or during activities that involve the use of the forearm muscles. Pain can also be inf icted by elbow extension against resistance, with bent wrist (Opris, 2007).

Diagnosis is mainly clinical. Musculoskeletal ultrasound can show swelling, hypoechogenicity and sometimes neovascularization in the insertion areas of the tendon on the median epicondyle (Opris, 2007). In chronic cases, tendinous calcif cations may occur; these calcif cations can also be detected during radiological examination (Bojinca, 2007).

Treatment consists of rest, avoiding forearm muscle overuse, local cold compresses, painkillers, NSAIDs (preferably topical) (3). Local inf ltrations with glucocorticoids are also effective (Bojinca, 2007). In the long run, muscle toning isometric exercises and adequate training technique are important (4).

Medial epicondylitis ("golfer's elbow"/golfer's epicondylitis) is rarer and is due to the tendon damage of the f exor carpi radialis muscle. It causes pain on pressure on the medial epicondyle and f exion of the f st against resistance (Bojinca, 2007). Diagnosis and treatment are similar to those for lateral epicondylitis.

Olecranon bursitis occurs following local trauma, most often by falling on hard surfaces (volleyball, contact sports). The bursa can be swollen and painful, and aspiration can sometimes highlight sanguineous f uid (Bojinca, 2007; Opris, 2007). Diagnosis is clinical +/- by ultrasound (hypo/ isoechogenic collection in the olecranon bursa) (Bojinca, 2007; Opris, 2007). Treatment is conservative: local cold compresses, pain killers/anti-inf ammatory drugs (preferably topical). In case of signif cant collection, liquid aspiration can be necessary (Bojinca, 2007).

The radiocarpal joint (f st) and the hand

Fist and hand lesions frequently occur in sports and may affect ligaments, tendons, bones, muscles and nerves (Carlson, 2012). In many cases it is acute conditions, injuries that cause sprains, fractures – a pathology that does not involve rheumatology. Repetitive moves of the f st and f nger joints may cause subacute and chronic conditions such as tendinitis, tenosynovitis, synovial cyst and carpal tunnel syndrome. These occur in sports that intensively use the f st joint (baseball, volleyball, weight throw, tennis, gymnastics), but also following trauma by falling (5).

In the tendinitis and tenosynovitis of the hand f exors and extensors, the tendons of the f nger f exors (superf cial and deep), f exor carpi radialis and f exor carpi ulnaris muscles can be affected. Pain in the palm of the hand occurs, accentuated by f nger f exion, more frequently in the middle and index f ngers. The clinical exam is based on palpation and identif cation of sensitive and possibly swollen areas along the tendon sheaths. The most vulnerable of extensor tendons are: the extensor carpi ulnaris, the 5th f nger extensor and the index f nger extensor (Bojinca, 2007). Diagnosis is mainly clinical. The ultrasound examination shows a thickened and hypoechogenic tendon, with occasional collection in the tendon sheath (tenosynovitis) (5). Treatment is conservative: rest, splints/orthoses, cold local compresses, anti-inf ammatory medication administered locally or orally. Glucocorticoids injected locally in the tendon sheath can sometimes be useful (Bojinca, 2007; Chung, 2016).

De Quervain's tenosynovitis affects the thumb's short extensor and long adductor muscle tendons. It results from repetitive activities that involve gripping with the thumb, along with f st movements: golf, squash, badminton (5). Clinically, there is pain with or without swelling above the radial styloid. Pain can be triggered through the Finkelstein test: thumb f exion in the palm, followed by the passively forced ulnar deviation of the f st (Bojinca, 2007); (5). Diagnosis, ultrasound examination and treatment are similar to those for hand f exor and extensor tenosynovitis.

The carpal tunnel syndrome is a frequent cause of hand paresthesia. The medial nerve and f exor tendons pass through a common tunnel determined by the carpal bone and transverse ligament. Any process that narrows the tunnel compresses the median nerve, which innervates the thenar muscles, the radial lumbrical muscles and the skin of the radial part of the palm (f ngers 1, 2, 3 and the radial half of f nger 4) (Bojinca, 2007). In the case of athletes, it is most often f st f exor tenosynovitis or repetitive movements of the f st joint that cause repeated compression of the median nerve (Bianchi et al., 2013). The carpal tunnel syndrome causes pain, paresthesia and sometimes anesthesia in the mentioned area, most frequently at night; they are generally alleviated by the movement of shaking of the hand. Symptomatology can be reproduced through Tinel's sign (percussion of the transverse carpal ligament) and Phalen's sign (maximum f exion of the hand on the forearm for 1 minute) (Bojinca, 2007). Diagnosis is mainly clinical. Musculoskeletal ultrasound is useful to measure the median nerve diameter (<12 mm) and to show the possible compression causes (Opris, 2007). Nerve conduction studies are sometimes necessary. Treatment is mainly conservative: rest, use of orthoses, NSAIDs. Local cortisone inf ltrations are also useful. Surgical decompression of the nerve might be necessary in chronic cases (Bojinca, 2007; Chung, 2016); (3).

Synovial cysts occur adjacently to joints or tendons. The most frequent location is the radiocarpal joint, both on the dorsal and palmar sides, followed by the base of the f ngers on the palmar side. These are round or oval formations with clear liquid or gelatinous content. Their etiology is unclear, but it is possible they might be caused by repetitive local mechanical irritation. They occur in handball, tennis, racket sports players. They may grow in size or may spontaneously disappear, they can be symptomatic or not (6). Diagnosis is clinical. Musculoskeletal ultrasound shows a well-outlined hypoechogenic collection. Treatment is only necessary when these are symptomatic: NSAIDs, aspiration +/- injection of cortisone preparations; surgical excision is rarely necessary (Chung, 2016); (6).

Trigger f nger

The main cause is the overload of the f nger, with thickening of the f bro-connective anchorage system of the f exor tendons of the f ngers. Other causes are tendinitis, tenosynovitis or local synovial cysts. The f exor tendons are stopped from properly sliding, especially during f nger extensions, the tendons remaining blocked (Opris, 2007). It occurs in athletes practicing sports that involve repetitive grabbing movements, in basketball players (3). Diagnosis is clinical. Ultrasound examination highlights the cause.

The rupture of the f bro-connective anchorage system of the f exor tendons most frequently occurs during climbing. This will lead to the removal of tendons from the bone surface of the proximal or middle phalange, which can be highlighted by an ultrasound examination (Opris, 2007).

Lower limb conditions

Sports traumas of the *hip area* usually cause tendon ruptures, often with the avulsion of a bony fragment at the insertion level (Opris, 2007; Blankenbaker & De Smet, 2010; Smith et al., 2010). Overload in the hip area causes bursitis, tendinitis and sometimes a snapping hip (1); (8); (Seidenberg & Lynch, 2015; Anderson et al., 2001).

Bursitis is the inf ammation of the bursae, either through direct trauma or through repetitive movements. Symptomatology mostly consists of spontaneous pain during local pressure or caused by certain movements (Bojinca, 2007; Blankenbaker & De Smet, 2010); (8). Diagnosis is clinical +/- by ultrasound. The ultrasound examination shows a hypoechogenic or transonic collection in the examined bursa. Through bursa tapping, serous or bloody f uid is extracted in case of direct trauma. Synovial proliferations and calcif cations may occur in chronic bursitis (Opris, 2007). Treatment is conservative: rest, cold compresses, NSAIDs. In some cases, aspiration and glucocorticoid inf ltrations are needed (Tammareddi et al., 2013).

Trochanteric bursitis is the most frequent hip bursitis. Pain is felt in the trochanteric and lateral area of the thigh. The sitting position exacerbates pain in the area concerned (Bojinca, 2007). It occurs following direct trauma, in cyclists and sports that involve running (1); (Bianchi et al., 2013).

Ischiogluteal bursitis occurs following direct trauma, sitting on hard surfaces for long periods of time or repeated micro-trauma in the ischial area. Pain is exacerbated while sitting and at pressure on the ischial tuberosity (Bojinca, 2007); (8). It occurs in athletes practicing horseback riding, cycling (8).

Iliopsoas bursitis causes pain in the inguinal area and on the inside of the thigh, accentuated on passive hip hyperextension (Bojinca, 2007). It occurs during activities that involve repetitive hip f exion, in runners and swimmers (8); (Smith et al., 2010).

The snapping hip (coxa saltans) is characterized by the presence of a sound (snap) and sometimes pain during hip movements or walking. The causes can be intra-articular, internal and external. The intra-articular snap is due to certain lesions of the hip joint; the external snap is associated with a conf ict between the thickened iliotibial band or the anterior side of the large gluteus and the greater trochanter. The internal snap occurs on the slip of the iliopsoas muscle tendon over the iliopectineal eminence. Ultrasound plays a very important role in the diagnosis of these changes. This condition occurs in athletes practicing gymnastics, ballet, karate (Opris, 2007); (8).

Hip adductor tendinitis causes subpubic pain that irradiates to the inner side of the thigh and occurs when one or more hip adductor tendons are damaged (8). Clinically, it can be observed through pain during palpation of the tendon insertions on the ischiopubic ramus, during the passive abduction and abduction of the thigh against resistance. It occurs in runners, gymnasts and horseback riders. Treatment is conservative: NSAIDs, pain killers, local cold compresses (Tammareddi, 2013); (3).

The knee is the largest and most complex joint of the body and, automatically, the most prone to injuries. The knee joint bears, in some effort situations, the body weight multiplied a few times over. Knee injuries occur by overloading of the joint during performance sports or intense physical activities, but also following a fall or a wrong movement (DeHaven & Lintner, 1986; Nicolini et al., 2014); (9). Among the most frequent knee injuries are those of the crossed ligaments, collateral ligaments, articular cartilage and meniscus (Nicolini et al., 2014); (9). The symptoms are pain and reduced mobility, but mostly feeling more or less intensely the knee joint instability (1); (Bianchi, 2013).

Meniscus lesions (ruptures) occur frequently, given the shallow location of the meniscus and the fact that very high functional pressure is put on it. These cause pain in the articular interlining, accentuated by knee movements and functional impotence, especially when climbing or descending stairs. In the case of recent lesions, hydrarthrosis can also be present. They occur in any sports activity that involves running and rotating movements of the knee (4); (Bianchi, 2013). Ultrasound is a suitable imaging method for the assessment of the meniscus, especially of the external part; the internal part can sometimes be diff cult to examine. Meniscus ruptures have the appearance of a large hypoechogenic line from the surface of the meniscus and an irregular external outline (Opris, 2007). MRI is the examination of choice, providing a detailed image of the lesion. Subtle or incomplete ruptures are treated in a conservative manner (orthoses/splints, NSAIDs/pain killers, cold compresses, rehabilitation treatment), while more severe lesions need surgical treatment (4); (10); (Bianchi, 2013).

The jumper's knee is proximal patellar tendinosis that occurs by overbearing of the knee extensor mechanism. It develops following certain modif cations caused by repeated micro-trauma or intratendinous cortisone injections. It occurs in athletes, especially volleyball and basketball players, and is one of the most important chronic conditions of the knee (9). Clinically, pain is the main symptom. Initially it occurs right after sports activities, but in advanced stages, pain is continuous and sports performance is reduced (Opris, 2007). Diagnosis is clinical and by ultrasound – focal or nodular hypoechogenic defects, hyperechogenic f brosis areas or calcif cations, neovascularization (Opris, 2007). Treatment is mainly conservative: cortisone inf ltrations are not recommended, as there is a risk of tendon rupture (1).

The Pellegrini-Stieda syndrome is a calcif cation area of the medial collateral ligament, adjacent to the medial femoral epicondyle (11); (Kogon et al., 1987). Until now, it was linked to old trauma, but nowadays the lesion is considered to be a heterotopic ossif cation (Opris, 2007); (11). It sometimes causes pain in the medial side of the knee, sometimes with progressive movement limitation. Pain is usually self-limiting and improvement occurs within a few months, with the help of rest and NSAIDs. The lesion can be detected by ultrasound, as well as by radiological exam (Bojinca, 2007).

Knee bursitis occurs in sports with overload on the knee and high risk of falling and direct trauma, such as volleyball, football and wrestling. Diagnosis is clinical +/- by ultrasound and, in case of suspicion of lesions affecting other structures, radiological and MRI examinations may be necessary. Treatment is conservative; in some cases, bursa aspiration, injection of cortisone preparations or even surgical excision is needed. In case of bursa infection, antibiotic treatment and aspiration or drainage are required (Bojinca, 2007); (3).

The prepatellar bursa is frequently damaged in knee trauma. It occurs either through direct pressure on the walls, or through repetitive overload. Being situated on a rough plane with uneven outline, the prepatellar bursa is prone to develop friction bursitis. Clinically, it has the aspect of an inf ammatory reaction, with painful and distended bursa (Opris, 2007).

Infrapatellar bursitis occurs between the patellar ligament and the tibia. It can also cause pain and swelling after trauma, and is sometimes associated with the jumper's knee (Bojinca, 2007); (1).

Anserine bursitis causes pain in the medial region of the knee, approximately 5 cm under the articular interlining. Pain is exacerbated when climbing stairs and during pressure on the "pes anserinus" (the tendons of the sartorius, gracilis and semitendinosus muscles) (Bojinca, 2007).

The popliteal cyst (Baker's cyst) is caused by the inf ammation of the popliteal bursa. Any knee condition that causes accumulation of synovial liquid can be further complicated by the emergence of such a cyst (like a

hernia on the posterior side of the knee). Symptomatology depends on the cyst size. The cyst can be asymptomatic, it may cause discomfort during the complete extension and f exion of the leg or, in case of rupture, it can cause the pseudothrombophlebitis syndrome (Bojinca, 2007). Diagnosis is clinical and by ultrasound - conf rmation and size of the cyst, possible associated lesions; MRI is useful in order to assess the associated pathology inside the knee. Treatment is based on the size and persistence of the cyst. Some cysts can spontaneously resorb, while others need aspiration and injection of glucocorticoids. In more severe cases with associated pathology, surgery may be necessary (1).

Iliotibial band syndrome is one of the most frequent overload lesions and is commonly found in runners, cyclists, weight lifters and footballers. It causes pain on the lateral side of the knee, through friction between the iliotibial band and the external femoral condyle, causing the band's f brillated structure to be thickened and effaced. Frequently, iliotibial bursitis is also associated. Initially, pain occurs only during physical activity and, as the lesion worsens, pain can irradiate to the external side of the thigh and sometimes the leg (Bianchi, 2013). Diagnosis is clinical, imaging being necessary only in few cases. Treatment consists of cold compresses, pain killers, stretching, local ultrasound; cortisone inf ltrations run the risk of ligament and tendon lesions; surgical treatment is rarely necessary (1); (Bianchi, 2013).

The Osgood-Schlatter disease is one of the most common causes of anterior knee pain in children and teenagers (Nakase et al., 2015); (12). It is caused by traumatic rupture or overbearing of the ossif cation center from the tibial tuberosity (12). It occurs following actions that involve repetitive tractions of the patellar tendon (Opris, 2007; Nakase et al., 2015). Treatment is mainly conservative (Opris, 2007).

Other ligament and tendon lesions

Crossed ligament lesions frequently occur during sports activities and result from pivoting movements, single foot landing or direct trauma. They cause pain and instability in the knee. The anterior crossed ligament is more frequently affected than the posterior one. In order to assess these lesions, MRI examination is necessary. Surgery is also required (1); (9); (Bianchi, 2013).

Collateral ligament lesions usually involve a signif cant force, such as a fall during skiing, or direct impact on the lateral side of the knee or leg. If the trauma is very strong, the ligaments may rupture. Lesions cause pain, sometimes with swelling and hematomas. Treatment is based on the severity of the lesion: conservative, orthopedic or surgical (1); (9); (10).

The quadriceps tendon, formed by the tendinous ends of 4 muscles (rectus femoris, vastus medialis, lateralis and intermedius), may suffer partial ruptures (especially rectus femoris), or total ruptures, generally at the patellar insertion level. Sometimes the rupture is accompanied by the avulsion of a bone fragment at the base of the patella (Opris, 2007).

The patellar tendon may be totally or partially ruptured, more frequently at its proximal or distal insertion, it can be accompanied by bone avulsion, sometimes with hematoma at the rupture site (Opris, 2007).

The ankle and the foot

The ankle joint carries the entire body weight and sometimes, during certain sports activities, it supports 20 times the body weight. The most frequent ankle and foot lesions occur following trauma, being acute lesions (1); (Hsu & Anderson, 2016). Ankle sprain is the most frequent lesion, occurring during physical activities and most of the time affecting the lateral structures of the ankle (Opris, 2007; Bianchi, 2013; Hsu & Anderson, 2016). Of all chronic lesions at this level, Achilles tendinopathy and plantar fasciitis must be considered.

Achilles tendinopathy

Achilles tendon, the longest and most powerful of the human body, is frequently damaged during sports activities that involve the sudden dorsif exion of the foot, such as track and f eld, football, tennis, volleyball. Retrocalcaneal or superf cial bursitis is frequently associated to tendon alterations (Opris, 2007). Partial or total ruptures may also occur. Achilles tendon lesions cause pain, swelling, sometimes motion crepitus and dorsif exion pain (Bojinca, 2007). The use of the following terminology is recommended for Achilles tendon overload pathology: tendinopathy of the middle portion of the Achilles tendon, acute paratendinopathy, chronic paratendinopathy, insertional Achilles tendinopathy, retrocalcaneal bursitis, superf cial calcaneal bursitis (1); (Opris, 2007). Diagnosis is clinical and by ultrasound (Hunt et al., 2013). Treatment is conservative and orthopedic, in some cases surgery being necessary (Chinn et al., 2010).

Peroneal tenosynovitis/tendinitis manifests through pain on the lateral side of the ankle, at lateral malleolus level. Peroneal tenosynovitis is frequent in athletes, being associated with trauma by inversion and chronic instability of the ankle. Peroneal tendinosis has a chronic lesion signif cance. Peroneal tendon dislocations (acute or chronic recurrent), especially short peroneal tendon dislocations, are caused by sudden dorsif exion associated with ankle eversion and peroneal retinaculum rupture (Opris, 2007). Peroneal lesions occur in runners, basketball players, dancers and athletes practicing sports that involve jumping. Diagnosis is clinical and by ultrasound, and treatment is conservative, surgery being rarely necessary (1); (Opris, 2007; Hunt et al., 2013).

Posterior tibial tendinitis causes pain behind the medial malleolus, due to trauma or excessive pronation movements (Bojinca, 2007).

Plantar fasciitis is the most frequent cause of pain in the heel. Pain is more accentuated in the morning, when switching to orthostatism. It mostly occurs in athletes, dancers, basketball players and older persons practicing sports (Opris, 2007). Diagnosis is clinical +/- by ultrasound (Hunt et al., 2016). Treatment is conservative: cold compresses, pain killers, wearing plantar support bands, shoe inserts or shock absorbing shoes, physiotherapy. Sometimes cortisone inf ltration can be useful (1).

Ligament lesions

Most frequently, foot traumas result in ligament lesions.

Lateral foot ligaments (talof bular and calcaneof bular) are the most frequently affected. In ankle inversion trauma, more than half of the cases show a single lesion of the anterior talof bular ligament. Diagnosis is clinical and by ultrasound, and treatment is conservative (Opris, 2007; Hsu & Anderson, 2016).

Arthrosis in athletes

Arthrosis is a multifactorial and heterogenic degenerative arthropathy, characterized by the progressive degradation of the articular cartilage, accompanied by a hypertrophic reaction of the subchondral bone, which causes a neoformation of bone and cartilage, as well as various reactions from the other articular structures (synovia, capsule, meniscus) (Buckwalter & Lane, 1997). Arthrosis is by far the most frequent joint condition, its incidence increasing with age (Buckwalter, 2003). The most frequent location is in diarthrodial joints, such as the knee, the hip and the hand (Zeller & Sukenik, 2008; Vignon et al., 2006). The etiological factors responsible for arthrosis are: medical history, age, gender, obesity, articular hypermobility, mechanical stress and trauma (Buckwalter & Martin, 2004). Onset is insidious and evolution is slowly progressive (3). Clinically, it is characterized by mechanical pain. Diagnosis is clinical and radiological; in recent years, musculoskeletal ultrasound has been increasingly used to assess degenerative alterations, allowing extensive assessment of most articular alterations present in arthrosis. Treatment is conservative and symptomatic: painkillers, NSAIDs, chondroprotective drugs, physiotherapy, balneotherapy. Sometimes cortisone or viscoelastic solutions (hyaluronic acid) inf ltrations are used. More advanced cases require surgical treatment (3).

It is well known that physical activity improves health and preserves articular function by f ghting ankylosis. Also, physical activities are an important method to treat arthrosis but, at the same time, practicing sports can increase the risk of arthrosis by joint overload and high trauma risk (7).

Intense mechanical tensions on the joint surface cause micro-fractures of the subchondral bone. This process causes cartilage alterations. The absence of a recovery period may inhibit articular regeneration. Repeated accidents risk destabilizing the joint and increase friction, thus leading to the onset of arthrosis (Fodor, 2013). Traumas also contribute to it, either through a direct (rough impact) or indirect mechanism (chronic tendon and ligament lesions, articular instability, periarticular ossif cations). The surgical treatment of pre-existing lesions (meniscectomy, osteosynthesis, ligament and tendon sutures/reconstructions) causes degenerative alterations of the joints (7); (Fodor, 2013).

Joint degeneration in performance sports is very common. Thus, gonarthrosis frequently occurs in football players (by affecting the peroneotibial joint), in weightlifting by f exion at 90 degrees with weights, and in any sports activity that involves running, jumping, trauma. Omarthrosis frequently affects rugby players through recurrent scapulo-humeral sprains, or tennis players through repetitive micro-traumas at this level. Due to insuff ciency of the cotyloid cavity, coxarthrosis occurs in dancers. Regarding the ankle, the most "arthrogenic" sports are: rugby, football, handball, basketball, track and f eld (Fodor, 2013).

Conclusions

1. The risk of arthrosis in athletes seems to depend on the practiced sports, their duration, and occurring injuries.
2. Contact sports increase the risk of arthrosis through trauma and hyper-use. Lesions can be prevented by correct training techniques, use of adequate sports equipment and appropriate rest intervals.

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Features of the surgical management of inguinal hernias developed in professional athletes

Particularităţile managementului chirurgical al herniilor inghinale apărute la sportivii de performanţă

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Abstract

Inguinodynia occurs in 5-18% of athletes practicing football, hockey and other sports, a fact that can f nish their career prematurely. This is a controversial symptom in the clinical assessment of a patient in general and even more so in a patient practicing a performance sport. Inguinal pain can be attributed to a variety of osteoarticular, musculoaponeurotic, abdominal or uro-gynecological pathologies. Differential diagnosis involves multiple, complex investigations, not always available to the clinician. If the clinical appearance is not relevant, considering the physical prof le of the patient, the physician may neglect a lesion easily identif able in a normal patient. The therapeutic management of inguinal pain, until the identif cation of its etiology, may include physical rest, passive and active physical therapy, intravenously administered corticotherapy, and if the diagnosis of an inguinal parietal defect is conf rmed, varied, open or laparoscopic surgery, tissue or alloplastic procedures will be performed.

Choosing the right therapeutic attitude and the right surgical procedure is sometimes diff cult, and only a tailor-made, targeted therapy for each patient can lead to remarkable results. However, this paper aims to draw some general directions of the therapeutic attitude.

Keywords: inguinodynia, inguinal hernia, tissue reconstruction, alloplastic procedure.

Rezumat

Inghinodinia apare la 5-18% dintre sportivii ce practică fotbal, hochei şi nu numai, determinând chiar încheierea precoce a carierei sportive. Aceasta reprezintă un simptom controversat în evaluarea clinică a unui pacient în general şi cu atât mai mult la un pacient ce practică un sport de performanţă. Durerea inghinală poate f atribuită unor variate patologii osteoarticulare, musculo-aponevrotice, abdominale sau uro-ginecologice. Diagnosticul diferenţial presupune investigaţii uneori multiple, complexe, nu întotdeauna la îndemâna clinicianului. Dacă aspectul clinic nu este unul relevant, având în vedere prof lul f zic al pacientului, medicul poate omite un aspect lezional uşor identif cabil la un pacient obişnuit. Managementul terapeutic al durerii inghinale, până la identif carea etiologiei acesteia, poate include repaus f zic, terapie f zică pasivă şi activă, corticoterapie administrată intravenous, iar în condiţiile în care se stabileşte diagnosticul de defect parietal inghinal, intervenţii chirurgicale variate, deschise sau laparoscopice, procedee tisulare sau aloplastice.

Alegerea atitudinii terapeutice corecte şi a procedeului chirurgical correct este uneori dif cilă şi doar o terapie personalizată adresată ţintit f ecărui pacient poate conduce către rezultate remarcabile. Cu toate acestea, lucrarea de faţă îşi propune să traseze câteva direcţii generale de atitudine terapeutică.

Cuvinte cheie: durere inghinală, hernie inghinală, reconstrucţie tisulară, procedură aloplastică.

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Introduction

Chronic inguinal pain is a symptom that occurs both in athletes, with a frequency of 5-18% (Kachingwe & Grech), and in the general active population. It was interpreted as athletic pubalgia, pubic osteitis, Gilmore hernia, enthesopathy of Ashby's inguinal ligament, so it was considered to be a pubic inguinal pain syndrome (Campanelli, 2010). This syndrome is often found in ball sports, when shear movements or those involving a sudden change of direction are performed, and may originate in any inguinal structure: muscular, tendinous, bone, fascial, nervous, articular (Jansen et al., 2008; Campanelli, 2010).

This condition has been drawing more and more attention lately, given the risk of professional athletes of being forced to give up successful careers. With regard to the term hernia, there are many discussions; in general terms, a real hernia exists when there is a hernia sac with internal content. In the f eld of sports medicine, the term "hernia" is not universally accepted; in the event of such symptomatology - inguinodynia, a rather reserved attitude towards a precise diagnosis is adopted, most often by the term pubalgia or painful inguinal syndrome. The British Hernia Society recommends the term "inguinal tear" that better describes the damage to the posterior wall of the inguinal canal.

The inguinal canal is an interstitium located in the inguinal region of the antero-lateral wall of the abdomen. It has a length of 4-5 cm, 2 rings, superf cial and deep, and it is crossed by the spermatic cord in men, and the round ligament of uterus in women. The anterior wall is represented by the aponeurosis of the external oblique muscle, covered by the superf cial fascia. The posterior wall is formed by the transversalis fascia that coats the deep side of the transverse abdominal muscle. This fascia represents a weak point of the wall and is laterally strengthened by Hesselbach's interfoveolar ligament, and medially, from surface to depth, by the ref ex ligament, the conjoint tendon and the Henle ligament. The upper wall in its lateral 2/3 is formed by the lower edges of the internal oblique muscle and the transverse abdominis, and in its medial 1/3 by the conjoint tendon, the latter being often used in tissue reconstruction of the posterior wall. The lower wall is represented by the inguinal ligament which is stretched between the antero-superior iliac spine and the pubic tubercle, it has the appearance of a concave ditch and its posterior slope is formed by the bandelette of Thompson or the iliopubic ligament, a condensation at this level of the transverse fascia. This bandelette is used in the anatomical reconstruction of the posterior wall of the inguinal canal, and the surgical risk of this maneuver is passing the thread through the femoral vein which is located under it (Ciomu & Bistran, 2008).

Inguinal hernia which develops in athletes is a pathology known for some time. In 1966, Cabot reported 202 cases in 42,000 Spanish soccer players who had been examined over a period of 30 years. The London physician, O. Jeremy A Gilmore, describes this lesion for the f rst time and offers a surgical solution (Preskitt, 2011).

Athletic hernia is def ned as a musculoskeletal lesion of the inguinal canal f oor. It is not a typical hernia because there is no protrusion of a hernia sac. Instead, its management is the same as for a usual inguinal hernia (Preskitt, 2011).

The most common cause of hernias in athletes is the weakness of the posterior wall of the inguinal canal due to the imbalance in strength between the stronger adductor muscles and the less developed lower abdominal muscles (Campanelli, 2010; Unverzagt, Schuemann and Mathisen, 2017; Van Der Donckt et al., 2003; Moeller, 2007) resulting in transversalis fascia tear.

Material and methods

The paper is a review of the specialized literature, studied using platforms such as Pubmed, Google Scholar, NCBI, SpringerLink and other international databases.

In particular, the studies of 2004-2017 were taken into account, representing both original articles and guides of sports medical associations.

Results

Most of the patients who took part in the studies that we identif ed in the literature were males, aged between 20 to 50 years. The def ning diagnostic element was insidious unilateral pain, sometimes with referred pain at the level of the pubic tubercle and the inner thigh. Symptomatology was aggravated by effort and relieved by rest. Sometimes patients had pain in tensioning the long adductor. The classic presentation of inguinal hernia in the form of a pseudotumoral mass in the inguinal region, with impulsion and cough expansion, was often absent (Campanelli, 2010; Fon & Spence, 2000; Ekberg et al., 1988). Clinical examination identif ed the dilation of the external inguinal ring, but without a pseudotumoral groin mass. Of a series of 250 athletes who underwent surgery for chronic inguinal pain, only 4% had clear clinical signs of inguinal hernia (Jansen et al., 2008; Campanelli, 2010). Usually, pain had an insidious onset, but it could become bilateral, with some patients also experiencing scrotum pain.

The imaging investigations that proved to be the most relevant in identifying the hernia lesion and implicitly dictated a surgical solution were ultrasound, computed tomography and magnetic resonance imaging. Magnetic resonance, although being an expensive examination, which is extremely rarely used in the public health system in Romania for establishing the diagnosis of hernia, was proven in the studies we analyzed in this research superior to tomography because it visualizes all structures, the inguinal canal, inferior epigastric vessels, the inguinal ligament, inguinal rings, the spermatic cord, and allows differential diagnosis of pubic inguinal pain syndrome (Ekberg et al., 1988; Deysine, Deysine and Reed, 2002). The European Hernia Society recommends a standard protocol that initially consists of ultrasonography, and if this is negative, MRI associated with the Valsalva maneuver will be performed; if this investigation is also negative, herniorrhaphy will be taken into consideration.

We managed to analyze the inguinal pain etiologies and tried to divide them into several major directions (Campanelli, 2010; Brunt, 2016):

- muscular and tendinous lesions, especially of the long adductor muscle and the rectus femoris muscle (Swan

& Wolcott, 2007; Lilly & Arregui, 2002);

- osteitis pubis, more common in contact sports, involves adductor and gracilis muscles (Kesek, Ekberg and Westlin, 2002; Heise, Sproat & Starling, 2002; Ziprin, Williams and Foster, 1999);
- pelvic stress fractures, more common in athletes (van Veen et al., 2007);
- urological pathologies (prostatitis, epididymitis, urethritis, hydrocele) (Paajanen, Syvähuoko and Airo, 2004; Srinivasan & Schuricht, 2002);
- gynecological diseases (endometriosis, ovarian cyst, round ligament syndrome) (Jansen et al., 2008; Campanelli, 2010);
- connective tissue pathologies (rheumatoid arthritis, ankylosing spondylitis, Reiter's syndrome) (Swan & Wolcott, 2007; Heise, Sproat and Starling, 2002; Hackney, 1993);
- spinal and hip pathology (hip osteoarthritis, femoroacetabular impingement, acetabular labrum tear, femoral neck stress fracture, osteochondritis of vertebral bodies, L1 or L2 disc lesions).

Most authors whose papers we evaluated during the course of this work state that the initial therapeutic management of pubalgia should be physiotherapy for 6 to 8 weeks (Kachingwe & Grech, 2008; Jansen et al., 2008; McIntosh et al., 2000), but single physical therapy has not been proven to be effective.

A randomized study by Ekstand et al. comprised 66 football players, grouped into 4 categories: the f rst group had surgical treatment per primam, the second group had physiotherapy 3 times a week for 4 weeks, involving exercises for tightening the lower abdominal muscles plus non-steroidal anti-inf ammatory therapy, the third group had daily physiotherapy including 3 types of exercises for lower abdominal muscles, and the fourth group was the control group.

Of the four groups, the third had a signif cant improvement in symptomatology after about 3 months, but only the f rst group had real long-term benef ts from surgery, with the disappearance of symptoms after 6 months (Kachingwe & Grech, 2008). For patients who received conservative treatment and who did not show any improvement at the end of therapy, surgical treatment should be considered. As a conclusion of previous discussions, under the conditions of a clear diagnosis of inguinal hernia, surgery is indicated regardless of symptomatology.

Surgical treatment can be achieved by either the classic, open procedure, or laparoscopic approach, by tissue or prosthetic reconstruction; none of the surgical procedures cited in the literature was excluded from the therapeutic approach of inguinal hernia. Gilmore carried out a modif ed herniorrhaphy by reconstructing the aponeurosis of the external oblique muscle by strengthening the transversalis fascia and repairing the conjoint tendon. Other surgeons who approached the pathology that is the subject of this discussion and whose statements we identif ed in the literature used simple interrupted sutures at the ruptured edge of the external oblique fascia. The resumption of sports activity in these cases was in 5 weeks (Campanelli, 2010).

The surgical techniques currently used in athletic pubalgia are (Brunt 2016):

- primary tissue reconstruction:
    - Meyers
    - Muschaweck
- open approach with tension-free mesh;
- laparoscopic approach
    - totally extraperitoneal (TEP)
    - transabdominal preperitoneal (TAPP)
    - inguinal ligament release with TAPP (Lloyd)
- adductor tenotomy (partial or complete).

In Nam and Brody's literature review, both methods for repairing the posterior abdominal wall are included and analyzed: the open and laparoscopic approach. Over 90% of patients resumed their sports activity on average after 6 months. The open procedures used were Bassini and modif ed Bassini, modif ed Shouldice, Meyer pelvic f oor repair with and without long adductor tenotomy. The open approach involves reattachment of the rectus abdominis, the conjoint tendon and transversalis fascia to the pubic tubercle and inguinal ligament. Often, the anatomical components are reinforced by a polypropylene mesh – the Lichtenstein procedure (Kachingwe & Grech, 2008). Particular attention should be paid to the ilioinguinal nerve, as it can be later embedded in the f brosis around the mesh. If it is compromised anyway, its resection proximal to the internal inguinal ring may be considered (Brunt, 2016). Following alloplastic procedures, fewer recurrences occurred, and postoperative pain had a lower incidence. The laparoscopic approach is superior to the open one with respect to chronic pain and paresthesia. Surgeons who approach this type of pathology in sportsmen prefer the TEP technique, although the learning curve for TEP is longer than for Lichtenstein and even TAPP procedure. The convalescence period is clearly shorter in the case of laparoendoscopic interventions.

In general, in the surgical approach of parietal defects, alloplastic procedures are indicated for patients over 30 years of age, but in the case of athletes, this type of reconstruction may be considered for use in young men over the age of 18 years. However, young athletes in the period of growth will also be subjected to the tissue procedure (Brunt, 2016).

Young patients aged 18-30 years with unilateral hernia who underwent tissue surgery have a recurrence risk of at least 5% 5 years after the procedure was performed. In fact, patches less than 8x12 cm embedded laparoscopically are the cause of a higher rate of recurrence compared to those inserted using the Lichtenstein procedure (Simons et al., 2009).

The Baylor University Medical Center in Dallas tracked 100 athletes with inguinal hernia, operated over 12 years using the alloplastic procedure, the modif ed Lichtenstein technique. Patients were analyzed every 2 weeks and it was observed that already in the 3rd to 4th week of analysis, most patients no longer had postoperative pain.

They attended a cardiovascular exercise program to increase resistance. From the 6th week they could run. 98% of patients resumed their sports activity and were able to compete again after about three months (Preskitt, 2011).

Meyers and colleagues (Philadelphia) have the greatest surgical experience in this pathology that is the subject

of this article. 5200 athletes were operated between 1986 and 2008, of which 95.3% resumed their activity after 3 months (Bittner, 2016).

Muschaweck and Berger in Munich, Germany, present the postoperative evolution of 129 athletes operated using a minimal reconstruction technique - tissue process, between 2008-2009. Patients were able to lift up to 20 kg on the f rst postoperative day, and two days later they could pedal the bicycle. The mean resumption of activity for these patients was 18.5 (Brunt, 2016).

Over the course of 18 years, a team in Montreal has operated on 98 professional hockey players using the Lichtenstein procedure. Patients had a mesh of polytetraf uoroethylene (PTFE) inserted in the inguinal canal. The intervention also involved ilioinguinal neurectomy. 97 of the 98 patients returned to competition, only 3 of the patients had recurrent symptoms (Brunt, 2016).

Disscusions

The European Hernia Society describes a lower rate of recurrence for alloplastic procedures versus tissue procedures, and we agree with their perspective. In our clinic, a general emergency surgery clinic, there are no surgeries performed using tissue procedures. For this kind of treatment, the same society recommends the Shouldice technique. Although endoscopic techniques have a lower rate of postoperative complications regarding wound infections and hematoma than the Lichtenstein technique, they have a higher incidence of seroma, a longer learning curve and a longer duration of intervention than the open technique.

Concerning this discussion, for Romania, an impediment to practicing laparoendoscopic techniques is represented by the costs associated with these interventions; usually the prosthesis is not covered by the health insurance system (Simons et al., 2009).

From a cost-eff cacy point of view, in patients with unilateral hernia, the alloplastic open procedure is preferred, but in patients who have physically demanding jobs, such as athletes, especially in bilateral disease, the laparoscopic approach is desirable. In terms of cost-utility, the TEP technique is preferred.

The benef ts of TEP versus TAPP take into consideration several aspects. In the studies whose results we evaluated, following TAPP, the pain score at 6 hours, 24 hours, 1 week and 6 weeks, respectively, was higher than in the case of TEP, and the need for parenterally administered analgesics was higher in the case of TAPP. Scrotal edema was more common after TAPP. The duration of surgery and hospitalization was shorter for TEP than for TAPP. Bansal et al. observed a single recurrence in his study group after TAPP and no recurrence after TEP (Bittner, 2016).

The incidence of seromas was higher after TEP; an expectative attitude was adopted for them. Drainage is not indicated. The need for TEP conversion to TAPP occurred due to peritoneal adhesions and posterior wall injuries of the rectus abdominis.

There were no signif cant intraoperative visceral complications in any of the laparoscopic techniques (Simons et al., 2009; Bittner, 2016).

In terms of quality of life, there were no major differences between TEP and TAPP. A signif cant improvement approximately 3 months post-surgery was observed in both procedures. Unlike TEP, TAPP experienced an improvement in all aspects of life, with the exception of vitality and social functions (Bittner, 2016).

Ten articles in the period 1993-2011, which included 196 operated patients, concluded that laparoscopically operated patients resumed their sports activity after 4-8 weeks (Muhammad, 2012). At the same time, 90% of the patients who underwent open surgery had a good evolution and returned to sports competitions.

Even so, there is no consensus on the best surgical method. The British Hernia Society showed in 2014 that normal activity could be resumed faster following laparoscopic interventions, but there were no well-def ned case-control studies to prove this. The choice of treatment depends on the patient's choice and on the surgeon's experience in the type of procedure chosen.

Conclusions

1. Athletic pubalgia requires a multidisciplinary approach, comprising a specialist in sports medicine, a physiotherapist, an orthopedist and a surgeon.

2. Conservative treatment consisting of rest, injectable, oral or topical anti-inf ammatory therapy, physiotherapy, and physical exercise is recommended for all patients at the start of therapy. Physical recovery alone has not proven to be useful in the long run.

3. In the case of inguinal hernias in athletes, surgical treatment is the only one proven to be effective and offers the best chance of resuming sports activities at a level close to that before the occurrence of this pathology. In the case of unilateral or bilateral primary hernia, as well as recurrences, Lichtenstein or endoscopic alloplastic procedures are preferred.

4. Postoperative inguinodynia is rarely encountered after laparoscopic surgery and also after the use of polypropylene meshes regardless of the procedure used.

5. In the short and long term, the benef ts of TEP demonstrate the superiority of this technique versus TAAP, especially with regard to inguinodynia in athletic patients.

6. The resumption of sports activities following surgical treatment has been revealed to be approximately 4 weeks in most studies.

7. Exercise of the abdominal-pelvic muscle and hip muscle has greatly improved recovery and leads to a faster resumption of sports activities, similar to that before the development of the disease.

Conf icts of interests

No conf ict of interests.

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Mirror therapy in neurological rehabilitation

Terapia în oglindă în recuperarea neurologică

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Abstract

Neurological rehabilitation is a continuously developing area, involving patients with a degree of disability secondary to a nervous system disorder. Recently, a neurological rehabilitation technique has been innovated, mirror therapy, designed to inf uence neuroplasticity using an optical illusion.

This study aims to illustrate the positive effect of this therapy in neurological patients, adults and children, and to promote this modern therapeutic concept.

Using neurological rehabilitation, mirror neurons, mirror therapy as key words, the PubMed database was searched for studies monitoring the effects of this therapy in neurological patients.

The analyzed studies demonstrated the role of mirror therapy in improving phantom limb pain, in reducing bradykinesia in Parkinson's disease, as well as in accelerating motor recovery in stroke survivors. Hypotheses regarding the implication of mirror neurons in autism were also launched.

In conclusion, the mirror neuron network, the cellular substrate of this therapy, has an impressive potential to provide solutions for neurological rehabilitation.

Keywords: neurological rehabilitation, mirror neurons, mirror therapy.

Rezumat

Reabilitarea neurologică este o disciplină în continuă dezvoltare, adresată pacienților cu un grad de invaliditate secundar unei afecțiuni a sistemului nervos. Recent, a fost inovată o tehnică de reabilitare neurologică, terapia în oglindă, concepută să inf uențeze neuroplasticitatea apelând la o iluzie optică.

Lucrarea își propune să ilustreze efectul pozitiv al acestei terapii la pacienții neurologici, adulți și copii, și să promoveze acest concept terapeutic modern.

Cu cuvintele cheie - reabilitare neurologică, neuroni oglindă, terapia în oglindă - au fost căutate în baza de date PubMed studii care au urmărit efectele terapiei la pacienții neurologici.

Studiile analizate au demonstrat rolul terapiei în oglindă în ameliorarea durerii membrului fantomă, în reducerea bradikineziei din boala Parkinson, dar și în accelerarea recuperării motorii la pacienții supraviețuitori unui accident vascular cerebral. Au fost lansate, de asemenea, ipoteze cu privire la implicarea neuronilor oglindă în autism.

În concluzie, rețeaua neuronilor în oglindă, substratul celular al acestei terapii, prezintă un potențial impresionant de a oferi soluții în recuperarea neurologică.

Cuvinte cheie: reabilitare neurologică, neuroni oglindă, terapia în oglindă.

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Introduction

Neurological rehabilitation is a continuously developing area, with a major impact on the increase of the quality of life of patients with a degree of disability secondary to a nervous system disorder. With the revolutionary discovery of mirror neurons, researchers in this f eld have provided neurophysiological evidence of their role in the acquisition of knowledge (language, gestures), in empathy, as well as in the recovery of diminished or lost sensory and motor functions. Recently, a neurological rehabilitation technique termed mirror therapy has been innovated, which was designed to activate the mirror neuron network using an optical illusion, and thus to inf uence neuroplasticity in a non-invasive manner.

Researchers in the f eld of neurophysiology and neurological rehabilitation have focused their attention on the benef cial effects of mirror therapy in adult and pediatric patients with disabilities secondary to neurological disorders, promoting this modern therapeutic concept as an effective, inexpensive, well-tolerated tool that can be applied at home, with a scientif cally proven clinical effect.

Patients with various neurological disorders – sequelae after stroke or trauma/surgery, Parkinson's disease, phantom limb pain, complex regional pain syndrome – were included in numerous clinical trials, and changes occurring in symptomatology, the recovery of sensory and motor def cits, the increase of autonomy and the improvement of the quality of life were monitored following application of mirror therapy along with classical rehabilitation methods.

It has been demonstrated that this therapy had a positive impact in improving phantom limb pain, in reducing bradykinesia in Parkinson's disease, in rehabilitating stroke survivors. For patients with stroke, studies performed so far have shown the effectiveness of mirror therapy in increasing muscle strength in paretic upper and lower limbs, improving joint mobility, ameliorating coordination, balance and gait, and increasing the degree of autonomy in daily activities. Literature data suggest that mirror neurons will probably prove to be the etiology, as well as the key of the treatment of disorders such as autism.

Mirror neurons

Mirror neurons are, according to the neuroscientist Ramachandran, "neurons that shaped civilization". Some authors consider that these neurons represent a genetic adaptation meant to fulf ll a socio-cognitive function, with a decisive role in the development of interhuman relations (Cook et al., 2013).

Mirror neurons were discovered two decades ago in the brain of macaque monkeys, initially in area F4 of the premotor cortex and subsequently in the parietal lobe (Oztop et al., 2013). At that time, it was believed that their only role in monkeys was to recognize some observed actions. Later research has shown a much more complex function: their implication in understanding actions, intentions and in imitation has been demonstrated, hence their name of "mirror" neurons. Thus, it was concluded that these are visual and motor neurons at the same time (Rizzolatti, 2005; Cinteză, 2012).

Studies in this direction, being non-invasive, were also applied to humans; neuroscientists have shown that when a human subject observes an action performed by another subject, their motor cortex becomes active in the absence of initiation of an effective motor activity (Rizzolatti & Craighero, 2004). This was possible to demonstrate by high-performance imaging (functional MRI) and neurophysiological (magnetoencephalography, electroencephalography) methods, which recorded the activation of brain regions (area 44 and area 6) possibly corresponding to area F5 of the monkey brain (Rizzolatti, 2005).

Thus, the hypothesis of the presence in the human brain of a neuronal observation and motor execution system similar to that initially discovered in primates was launched (Oztop et al., 2013). In the literature, the concept of brain regions with "mirror properties" appeared. Neuroimaging showed that in humans, these brain regions are the precentral gyrus that comprises the premotor ventral cortex, the posterior region of the inferior frontal gyrus and the lower parietal lobe (McGarry, 2015).

It was assumed that this neuron network facilitates a direct connection between the emitter and the receiver of a message. Thus, the actions performed by a subject become messages easy to understand by another subject who observes them, without the cognitive processing of information being necessary (Rizzolatti & Craighero, 2004), given that the mirror neuron system turns visual information into knowledge (Cinteză, 2012). At the same time, researchers have suggested the fact that in the case of humans, the neurophysiological functioning mechanism of mirror neurons might be the basis of the development of language (Rizzolatti, 2005), also having implications in the f eld of affectivity, through empathy (Rizzolatti & Craighero, 2004).

Starting from the premise that mirror neurons are also present in humans, fulf lling functions that go beyond those identif ed in primates, neuroscientists have demonstrated by the same imaging and neurophysiological methods that in reality, there is an extensive mirror neuron network in the human brain, which does not function in isolation, but has the property to receive and transmit impulses to different brain regions, including the sensory motor cortex.

According to the authors of a study published in 2015, this extensive mirror neuron network overlaps larger brain areas than those initially discovered, which are connected to the classic mirror neuron system, having a distinctive role in processing emotional information. Imaging has evidenced that this network termed by authors extra-mirroring regions is most probably located in the insula, the middle and superior temporal gyrus and the superior temporal sulcus. It has been shown that in women this network is more extensive than in men, and that stimuli creating a certain emotional context activate at different intensities the supposed "mirror" brain regions (McGarry, 2015).

The transfer of these scientif c f ndings to medical practice was materialized by the innovation of a therapy meant to activate the extensive mirror neuron network, and thus, to modulate neuroplasticity: mirror therapy.

Mirror therapy. Hypotheses, indications, clinical results

Mirror therapy has captured the interest of researchers and clinicians due to the fact that it is an easy-to-use,

economical, patient-oriented treatment method (Arya, 2016). Having the mirror neuron network as a substrate, this therapeutic approach was designed for the reactivation of brain plasticity, with the aim of restoring lost functions and preserving residual functions. The starting point was the hypothesis that the movements of a limb visualized in front of a mirror trigger neuronal connections in the motor cortex concerned (Gurbuz et al., 2016). Neurophysiological and imaging studies using functional MRI were conducted in healthy human subjects, which demonstrated that the excitability of the primary motor cortex increases when the image of one's own moving hand in the mirror is watched (Kim et al., 2016), which supports the idea of neuroplasticity modulation by applying this therapy. Mirror therapy involves overlapping the ref ection of the movement of the healthy limb with the affected limb, creating in this way an optical illusion. A mirror is placed in the patient's midsagittal plane so that the image in the mirror of the healthy hemibody overlaps the projection of the affected hemibody. Under the kinesiotherapist's guidance, the patient attempts to perform symmetrical movements with both limbs, and then focuses only on observing the ref ected image of the healthy limb (Guo et al., 2016). In this way, the patient has the impression of seeing the affected limb as having normal kinetics (Garbuz et al., 2016).

Neuroscientist Ramachandran and coworkers introduced the mirror therapy method to treat phantom limb pain in patients with amputations in 1996 (Guo et al., 2016). They were also the f rst who suggested that this technique might improve the motor function of a paretic limb after stroke (Kim et al., 2016).

Phantom limb pain

It was assumed that this particular type of pain, phantom limb pain, is triggered by the conf ict created between visual feedback and the proprioceptive representation of the amputated limb. It was considered that the reduction of pain using mirror therapy might be due to the activation of mirror neurons in the cerebral hemisphere contralateral to the affected limb. Starting from these hypotheses, the authors of a study published in 2016 showed that mirror therapy performed for 15 minutes/day in patients with phantom limb pain reduced the intensity of pain, the number and duration of pain episodes in 100% of subjects (In et al., 2016). A research team in Istanbul has recently shown that in 15 patients with limb amputations, the severity of pain improved considerably after a 4 week mirror therapy program, applied daily for 40 minutes (Yıldırım & Kanan 2016).

Other studies published over the past years suggested that mirror therapy can also be extended with benef cial results to the treatment of pain in f bromyalgia, complex regional pain syndrome, diabetic neuropathy, pain of musculoskeletal origin, pain secondary to spinal cord injury (Castelnuovo et al., 2016).

Parkinson's disease

Bradykinesia, one of the cardinal signs of Parkinson's disease, is def ned as a reduction in the execution speed of a movement, with the progressive diminution of the range of motion, until complete blockage during simple repetitive movements. This slowness of movements is possible due to a hypoactivation of the primary motor cortex (M1). An asymmetry of motor involvement is present in the majority of the cases, being even proposed as a diagnostic criterion.

A team of neuroscientists started from the premise that mirror therapy in association with physical training improves the performance of both hands in patients with Parkinson's disease, by increasing the excitability of both primary motor cortices. A study was carried out which was aimed at checking whether mirror therapy could be a solution for the treatment of bradykinesia in these patients, and the effects of therapy on the hand more affected by bradykinesia were monitored in particular. The study included 12 patients with Parkinson's disease (Hoehn and Yahr stages 1-3, with correctly administered antiparkinsonian medication), and 12 healthy subjects; both groups attended a mirror therapy program for 10 minutes daily, with focus on the more affected hand. Motor cortex (M1) excitability was evaluated using transcranial magnetic stimulation. At the end of the study, it was shown that the speed of movement increased after mirror therapy for both hands, in both groups. It resulted that this technique applied to patients with Parkinson's disease improves f nger movement in the hand more affected by bradykinesia. Also, imaging demonstrated that mirror therapy induced an increase of M1 cortical excitability in both groups (Bonassi et al., 2016).

Stroke

Altschuler and coworkers suggested that mirror therapy provides a visual perception of the normal movement of the affected limb and through this, it might compensate for diminished or lost proprioceptive functions (Kim et al., 2016). In 1999, mirror therapy was introduced in post-stroke rehabilitation (Guo et al., 2016).

Subsequent studies provided additional evidence regarding the effectiveness of mirror therapy in the rehabilitation of motor functions in patients with limb paralysis: an increase in the gripping strength, range of motion, speed of movement, and an improvement of dexterity (Guo et al., 2016).

Garbuz et al. (2016) demonstrated the effectiveness of mirror therapy associated with conventional rehabilitation methods in the recovery of upper limb motor function in stroke patients. Patients with hemiplegia attended a daily mirror therapy program consisting of f exion and extension of the radiocarpal joint and f ngers of the unaffected hand, in front of a mirror. It was shown that, applied concomitantly with conventional rehabilitation treatment methods, this therapy is benef cial for the motor recovery of the upper limbs in hemiplegic patients and might represent a new stage in neurological rehabilitation by modulating neuronal plasticity.

The authors of a study recently performed in Korea used mirror therapy along with conventional therapy for 20 minutes daily, 5 days/week, for 4 weeks in patients with upper limb motor def cit after stroke. In front of the mirror, the subjects were instructed to perform gestures imitating daily gestures – starting with the f exion and extension of the f ngers and wrist in the f rst weeks, and ending with

complex tasks such as writing and drawing. At the end of the study, an important improvement in the function of the affected upper limb was obtained, with an increase in the patients' autonomy in the performance of daily activities (Lim et al., 2016). Also, studies have demonstrated that mirror therapy can also be used for lower limbs, improving plantar dorsif exion, an important element in the recovery of walking in patients with sequelae after stroke (Guo et al., 2016).

Using a technically advanced version of the concept of mirror therapy – virtual reality ref ection therapy, a team of scientists in Korea obtained an amelioration of walking and postural balance in patients with gait disorders secondary to stroke. Therapy was applied for 30 minutes, 5 days/week for 4 weeks, with a progressive increase in the complexity of the program. Initially, the subjects watched the f exion, abduction, adduction movements of the healthy limb joints, trying to imitate them with the affected limb; in the next stage, the tasks became more complex - pushing buttons with the toes concomitantly with the above mentioned movements, f rst with the healthy lower limb, then with the affected one. At the end of the study, the results showed a statistically signif cant increase in the functional capacity of the affected lower limb, an improvement of balance and gait (In et al., 2016).

Pediatric neurological pathology

Mirror therapy has been applied in pediatric neurorehabilitation, with promising results. In children with infantile cerebral palsy, it was shown that this therapy had the potential to improve the motor function of the upper limbs. A rehabilitation program using a mirror at home was conducted in 28 children, with 7 exercise models applied 15 minutes/day, 5 days/week, for 5 weeks. An increase in the speed of execution with a reduction in the time required for completing the exercise program from the f rst to the last week was obtained; adherence to the program was 100% and the level of satisfaction was high (Pasquet et al., 2016).

Stroke in children is a rare pathology, which leads to long-term cognitive and motor def cits. The authors of a review aimed to present the most frequent pediatric neurological rehabilitation techniques and to examine which of these techniques can be applied and has demonstrated effects in the rehabilitation of children with stroke. Alongside methods such as occupational therapy, hand arm bimanual training (HABIT), botulinum toxin injections, robotics, electrical stimulation, studies have shown that mirror therapy may have benef cial effects in neurological rehabilitation, particularly for upper limb motor def cit, if the intervention takes place as early as possible after the disease onset (Papathanasiou et al., 2016).

Mirror therapy applied concomitantly with occupational therapy to an 8-year-old female patient with tetralogy of Fallot and operated brain abscess, with secondary left hemiparesis, resulted in an improvement of daily manual activities, with an increase in the gripping strength and the muscle strength of the affected upper limb (Hebreo & Dungca, 2016).

Empathy and autism spectrum disorders

The origin of the word *emotion* is in the word *motion*. When they are happy, people gesticulate in a way that expresses their emotions; when they are sad, they adopt a tense posture, and by structural laryngeal changes, the tone of voice changes and sobbing appears; when the emotions of another person are observed, people are "moved", experiencing feelings of pity or compassion. All these remarks are considered by neuroscientists to be more than a metaphor: it is considered that when empathizing with a person, people experience this empathy through a process of simulation of a "movement" at neural level, which also involves the participation of mirror neurons (McGarry et al., 2014).

Autism represents a pervasive neurodevelopmental disorder, which is characterized by socialization and communication dysfunctions, stereotyped behavior, and the presence of atypias in perception – for example, def cient visual processing of neutral or emotional facial expressions. Some researchers consider that the development of autism is secondary to def cient neuronal connections, particularly in the prefrontal and parietal brain regions. Persons with autism are supposed to present an impairment in recognizing emotions by means of facial expressions, although there is little literature evidence in this respect. Empathic response by gestures and affective expressions is considerably more reduced in children with autism spectrum disorders compared to children with normal mental development, a difference at neural level being observed between the two categories of children (Silva et al., 2016).

According to a recent hypothesis, autism is characterized by two abnormalities from a neuropsychiatric point of view. The f rst abnormality refers to social cognitive def ciencies, described as mental aloneness, the lack of contact with the exterior world, and the absence of empathy. The second abnormality is represented by sensory-motor defects such as temper tantrums, head banging and some stereotyped movements. All these def ciencies and defects are currently considered to be secondary to the abnormal development of mirror neurons (Acharya & Shukla, 2012).

There are literature data suggesting that the inability of children with autism to normally interact with other people and manage ordinary life situations results from the absence of a normofunctional mirror neuron system (Palau-Baduell et al., 2011). Recently, this hypothesis of mirror neuron dysfunction in persons with autism has become the focus of attention of neuroscientists. Silva et al. (2016) conducted a study to assess the functional capacity of mirror neurons in children with autism. The aim of this study was to investigate the reactivity of the mirror neuron system to emotional stimuli in subjects with autism and in subjects with the same demographic characteristics without autism or mental disease, and to test the hypothesis that these subjects can be stimulated by biofeedback.

The study included 30 children, of which 10 with demonstrated autism, 10 with intellectual def cit and 10 neuropsychically healthy children. Electroencephalography was performed at two times, before and after cerebral stimulation, and changes occurring in the brain regions theoretically considered to be correlated with the presence of mirror neurons were monitored. The results showed that for all 3 groups, the brain stimulation process induced an additional activation of the studied brain areas. It was proved that mirror neurons in subjects with autism are

present in the studied cortical areas and are reactive to situations involving emotion processing. In other words, children with autism smile or are sad inside themselves (they have an emotional experience), but they do not show these emotions (they do not have emotional expressions). This behavior is probably due to the fact that children with autism do not have the cognitive ability to process environmental data and internal data adequately to generate a visible motor expression.

The authors of the study concluded that since the same brain activation was recorded in subjects with autism and healthy subjects, the diff culty of patients with autism in expressing their emotions is not secondary to the absence of mirror neurons. Also, the authors considered that mirror neurons are present in subjects with autism and tend to react when the subjects are exposed to emotional stimuli. Thus, the absence of an adequate emotional expression and the lack of harmony observed during interactions between subjects with autism and healthy subjects are more probably unrelated to the activation of these neurons or these are not located in the studied cortical area (Silva et al., 2016).

Another study (Dapretto et al., 2006) proved the contrary: neuroimaging showed that pediatric subjects with autism did not exhibit mirror neuron activity in the inferior frontal gyrus (pars opercularis) compared to healthy children in the control group, in an exercise of imitation of facial expressions.

These differences can be explained by studies involving functional MRI which suggest that a more extensive network of human brain areas has "mirror" properties than was initially thought (Acharya et al., 2012), but also by the f nding that mirror neurons are integrated in an extensive neuronal network (amygdala-hippocampal circuit, caudate nuclei, the cerebellum, and frontal-temporal regions) whose functioning is def cient in autism (Lauvin et al., 2012).

If mirror neurons are really involved in the interpretation of complex situations, the interruption of the neuronal circuit in which they are involved might explain the classic symptoms of autism and the lack of social skills in these patients (Silva et al., 2016), and might open perspectives using neurofeedback training for individuals with autism (Saff n & Tohid, 2016).

Further research providing new data about the inf uence on the functionality of mirror neurons might be the key to the treatment of adaptation disorders such as autism.

Conclusions

1. Mirror therapy was designed by neuroscientists secondarily to the discovery in the human brain of a neuronal observation and motor execution system – the mirror neuron network.

2. Mirror therapy was introduced in medical practice for its potential, demonstrated by imaging and neurophysiological methods, to reactivate brain plasticity, with the aim of restoring lost functions and preserving residual functions.

3. Initially used for the treatment of phantom limb pain, mirror therapy is currently successfully applied as an effective, accessible, patient-oriented and adverse effect-free neurorehabilitation method, associated with classical rehabilitation methods.

4. The main indications of mirror therapy are: improvement of phantom limb pain, reduction of bradykinesia in Parkinson's disease, rehabilitation of stroke survivors. It is also indicated in pediatric neurorehabilitation, with clinical effects demonstrated by studies.

5. The neurophysiological substrate of the activation of mirror neurons in the presence of visual and auditory stimuli, as well as their impressive potential to be the solution in neurological rehabilitation remains an area open to research.

Conf icts of interest

Nothing to declare

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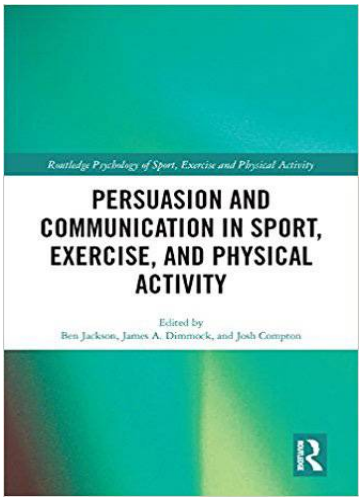
RECENT PUBLICATIONS

Book reviews

Persuasion and Communication in Sport, Exercise, and Physical Activity
(Persuasiune şi comunicare în activitatea f zică şi sport)
Editors: Ben Jackson, James Dimmock, Josh Compton
Publishing House: Routledge, August 9, 2017
302 pages; Price: £105,00



Within the series "Routledge Psychology of Sport, Exercise and Physical Activity", which aims to promote academic debate and bridge the gap between theory and practice in the f eld, a new really welcomed book was released at the end of this summer. It is an awaited and very useful book for all those – educators, instructors, coaches, personal trainers, etc. – whose diff cult mission is to make people more physically active for improving their sport and exercise experiences and benef ts. In other words, a book which helps the mentioned professionals to become more persuasive in effectively communicating messages to their so diverse, frequently even reluctant target populations. A work which considers the applications of persuasion frameworks within physical activity-related contexts and has the merits to summarize and adapt the recent developments in the f eld to communication topics in the respective settings.

Taking into consideration the complexity of the problems to be approached, the project brings together internationally renowned personalities of social, but also of health, and sport and exercise psychology. This is proved by the fact that apart from the three editors – Ben Jackson, specialized in exercise, health and sport psychology, James A. Dimmock, focused on interpersonal and impersonal factors that inf uence motivation for exercise, and Josh Compton, "assistant professor of speech" – 40 other specialists from different countries and universities have collaborated putting together their expertise, their efforts f nally resulting in a text which fully covers the topics that must be included in a book intended to exhaust all that the professionals mentioned above have to acquire for persuasively communicating in sport, exercise and phyical activity.

This text consists of two parts and a total of 16 chapters. Shortly speaking, the f rst 9 of them – i.e. Part I – address the main issues related to "Persuasion and Messaging", primarily emphasizing on the theoretical frameworks that might be used when communicating in sport, exercise, and physical activity. The various topics approached within this part are essential to learn from theory and research and to ensure that our communication efforts f nally achieve the intended outcomes.

Part II consists of only 7 chapters. This time, emphasis is more closely directed at interpersonal communication, the authors speaking about the different ways through which individuals communicate with others and, in some cases, even with themselves. Brief y, the topics addressed within this second part are as follows: ● the benef ts of need-supportive communication in physical activity and sport settings, ● communication skills and behaviors that leaders need to possess for inspiring others, increasing their conf dence and stimulating them to follow their goals, ● principled negotiation methods and interaction in physical activity and sport, ● how and why our bodily responses and postures may inf uence our feelings and behaviors and stimulate exercise participation, ● the nature and implications of communication processes in the particular case of sport teams, ● successfully communicating information about physical activity when addressing people with physical disabilities, and ● verbal and non-verbal methods of self-presentation in communicating information about ourselves within our sport and exercise environment.

Having in mind all these characteristics and qualities, as well as other overlooked but not minor ones, it can be said that the book represents a real invaluable tool for both those involved in research and practitioners. As a consequence, its publication must be considered a special happy editorial event, while its purchase is a necessity.

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Palestrica of the third millennium – Civilization and Sport
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EVENTS

The personality of Professor Dr. Iuliu Haţieganu commemorated at Dârja-Cluj (2)

Personalitatea Profesorului Dr. Iuliu Haţieganu evocată la Dârja-Cluj (2)

If at the f rst edition of the "Old Fair" held last year in Dârja, Panticeu commune, Cluj county, the wish to complete the event by commemorating the personality of Professor Dr. Iuliu Haţieganu appeared, at this year's edition on Saturday 26 August 2017, this intention was fulf lled thanks to the organizers – the Mayor's Off ce in Panticeu and the JCI (Junior Chamber International) Organization.

Iuliu Haţieganu was born to the family of a Greek Catholic priest, in Dîrja village, in 1885. He attended the Superior Middle School in Blaj, and then, the Faculty of Medicine of the Cluj and Vienna Universities. Among his remarkable activities and interests along his career, here are some that are also mentioned on his memorial plaque:

- He participated, as a delegate, in the Great National Assembly in Alba Iulia, on 1 December 1918.
- He conducted the f rst extensive studies on the health of the population in the rural environment.
- He founded the school of internal medicine in Cluj.
- He is considered to be the promoter of physical education in higher education; he founded the University Sports Park in Cluj – built to a great extent from his own savings.
- He had many valuable disciples: Leon Daniello, Ion Gavrilă, Aurel Moga, Octavian Fodor, Ioan Macavei, Ştefan Hărăguş, etc.
- He was *Magnif cus Rector* of the Cluj University, a titular member of the Romanian Academy, and a state secretary minister in the Iorga government.
- He distinguished himself by his intelligence, his teaching talent, by his humane attitude towards all his patients, regardless of age, social status or ethnic group.

On the occasion of the event organized in Darja, a village museum was set up in a class room, where the creation of a *Iuliu Haţieganu* area is intended.

This year's event was attended by more than 100 local people and guests. The Mayor's Off ce was represented by the Deputy Mayor Similian Tite, while Ştefan Fluieraş, a village delegate, distinguished himself among the organizers. The religious service was conducted by the priest Răzvan Fărăgău. On this occasion, the book *Words from Dârja (Vorbe din Dârja)* authored by the same Ştefan Fluieraş was also launched.

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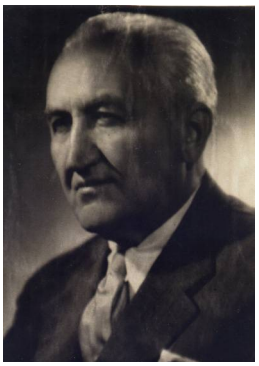
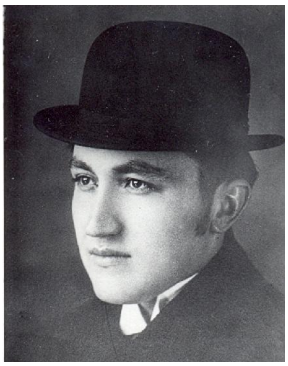
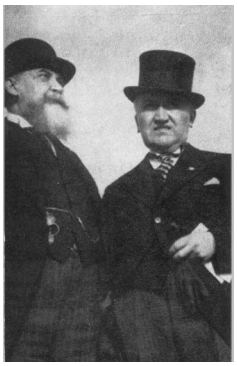


Professor Dr. Iuliu Haţieganu



Dr. Iuliu Haţieganu after graduating from the faculty, at the age of 24 years (1909)



Prof. Dr. Iuliu Haţieganu, alongside Nicolae Iorga (1931)

The University Sport Exhibition, 1943-1944

The unveiling of the memorial plaque

The *Iuliu Haţieganu* memorial plaque on the facade of the school in Dârja

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Xavier Pascual Fuertes, Professor Honoris Causa of the Babeș-Bolyai University

Xavier Pascual Fuertes, Profesor Honoris Causa al Universității Babeș-Bolyai

On Thursday, June 22nd, the Aula Magna of the Babeș-Bolyai University hosted the ceremony of awarding the title of *Professor Honoris Causa* to Professor Dr. **Xavier Pascual Fuertes** from the Instituto Nacional de Educación Física de Cataluña, Universitat de Barcelona.

In the laudation presented on the above mentioned occasion, the Dean of the Faculty of Physical Education and Sport, Associate Professor Dr. Leon Gomboș, said: "It is a great honor for me to present before you this laudation on the occasion of awarding the title of Professor Honoris Causa to Professor Dr. Xavier Pascual Fuertes, who stands today before us as:

- Professor Dr. at the University in Barcelona, National Institute of Physical Education from Cataluña.
- Main coach of the most titled handball team in the world, FC Barcelona, holding nine Champions League titles, the last two won under the guidance of Mr. Xavier Pascual Fuertes.
- Coach of the Romanian male handball team and at the same time coordinator of all male national teams.

Xavier Pascual Fuertes confessed with gratitude that when he decided to become a handball coach he asked himself "Who plays this sport best in the entire world? The Romanians!" Respectfully he said he had been studying the books and papers of the great Romanian trainers, which represented the cornerstone of his future career in coaching.

In addition, he expressed in a vivid, painful, nonetheless polite way of saying a cruel, but not to be contested reality: "Unfortunately your trophies and books are in black and white. Turn them into color yet again!"

Who is Xavier Pascual Fuertes?

Born on March 8th 1968 in Barcelona, he began his handball activity at the age of 9 during primary school, and ever since his life has been dependent on this sport. He evolved as a player of the children and junior teams of the FC Barcelona club; the step into senior playing came naturally; his sporting activity reached the climax when winning the title of European champion during the 1990-1991 season.

In 1991, he left the team of Barcelona, playing for a couple of teams in the Premier League of Spanish handball, combining his activity as a professional player with his professional and academic education.

In 1995, he successfully graduated from the Faculty of Physical Education and Sport of the University of Vigo, and during the following ten years, he was deeply concerned with continuous training, completing six postgraduate courses and nine courses organized by different sport federations in Spain.

Also in 1995, he received the highest coach category of the Spanish Handball Federation and one year later, he became an Expert Master in physical education and sport. Since 2006, he has been part of the national coach school of the Spanish Handball Federation as a professor.

In 2008 he became Doctor in Sciences of Physical Activity and Sport, a title awarded by the University of Vigo.

After ending his career as a professional player in 2005, his knowledge and competences, as well as his academic activity, which he started very early, did not go unnoticed and he was co-opted in the organizational chart of the FC Barcelona Club, f rst as a goalkeeper coach, then as a person responsible for the Academy of the Catalonian Club, then as secondary coach; in February 2009, he was appointed main coach, a function which he still holds today.

In 2014, he became the coordinator of the Department of Sports Theory at the University of Barcelona and, the same year, he became a collaborator of the European Handball Federation for Master Coach courses.

In June 2016, he accepted the position of coach of the National Romanian team alongside the position of coach at FC Barcelona, being recommended by his impressive title list; as a trainer he won no less than 37 trophies, the most important of which are:

- 2 Champions League titles (European Champions Cup)
- 2 Golden League titles (Club World Championships)
- 7 Spanish Champion titles
- 7 Asobal Cups (Spanish Cup)
- 7 Copas del Rei (Kings Cup)
- 6 Spanish Super Cups
- 7 Catalonian Cups.

Together with Alfred Gislason, coach of the THV Kiel team, he participated in 6 editions of the Final Four of the 8, which took place in the current format of the Champions League; they are the only coaches in the world who achieved this performance.

Mr. Xavier Pascual Fuertes' collaboration with the Faculty of Physical Education and Sport of the Babeș-Bolyai University began in 2016, when he accepted the position of coach of the Romanian national handball team, and was especially rich and productive.

When we suggested this collaboration he accepted it unconditionally, as he was more than thrilled about what was going to happen. He confessed to me that alongside the profession as a coach, his greatest satisfaction in life came from having the possibility to share his knowledge and experience with the students.

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Thus, he responded promptly whenever we asked him to meet with our students and give lectures at our faculty.

The availability and courtesy of Mr. Xavier Pascual Fuertes towards us always came along with his characteristic modesty and discretion; he did not want the press to take part in these meetings and lectures, as he centered his entire energy on the activity with the students.

The opportunity for our students, especially those attending the study program of Sport and Motor Performance, future coaches in different sport branches, to learn the kinks of the profession from one of the greatest personalities in the world of handball was a highly useful, but also pleasant and relaxing experience.

Professor Fuertes' competence, tactfulness and special charm made the activities with the students end with a standing ovation.

Professor Fuertes' qualities: reliability, thoroughness, continuous thirst for knowledge and self-improvement, extraordinary work capacity, turned him into a model worth following for our students, but I dare say, also for us members of the teaching staff working in sports performance.

I was promised that no matter how long his collaboration with the Romanian Handball Federation will last, our academic collaboration would be long term, which makes us tremendously happy.

During the very short time period spent in Romania, thanks to his deep skills, Professor Xavier Pascual Fuertes has been able to get a very precise picture of and diagnose Romanian professional sport and handball in particular, which unfortunately, at least as far as the male handball game is concerned, is in deep suffering.

It is known that for eliminating this suffering we need a proper diagnosis, meant to raise awareness and shoulder the responsibility regarding the state of professional handball in Romania, as this represents the f rst step to healing and recovery.

At the beginning of this laudation, I presented Professor Xavier Pascual Fuertes in his triple role...please allow me now, at the end of my speech, to add a fourth role, the one that I am most fond of: his role as a colleague, a member of the teaching staff of the Faculty of Physical Education and Sport, and a member of the academic staff of the Babeş-Bolyai University, as we are convinced that Xavier Pascual Fuertes' work as a professor, coach and scientist absolutely justif es his receiving the title of Professor Honoris Causa of our University, which is honored by the presence of such a personality within its ranks."

Assoc. Prof. Dr. Leon Gomboş
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Group picture, UBB building

Presidium: Prorector - Assoc. Prof. Dr. Cristian Marius Litan, Prorector - Prof. Dr. Mihaela Luțaș, President of the UBB Senate - Pr. Prof. Dr. Ioan Chirilă, Prorector - Prof. Dr. Flaviu Călin Rus, Prorector - Prof. Dr. Dan Lazăr, Dean of FEFS - Assoc. Prof. Dr. Leon Gomboș

Singing the anthem

Awarding of the PHC diploma

Presentation of the speech in the Aula Magna of UBB

The annual meeting of veteran athletes of the „U” Cluj Club (23)

Întâlnirea anuală a atleţilor veterani de la „U” Cluj (23)

The annual meeting of veteran athletes of the “U” Cluj Club was initiated 23 years ago, in 1995, after the 75th anniversary of the “U” club, which took place in 1994.

Having already become traditional, the meeting held on Saturday 2 September 2017, at 10 a.m., was the 23rd. Like in the previous years, the landmark of the meeting was the monument situated at the entrance to the athletics f eld, erected in the memory of Doctor Ioan Arnăut and Prof. Ion Moina, a multiple national and Balkan champion in the 100 and 200 m sprint.

The expected stars of the event were: Alexandra Taifas Sicoe, a huge name of Romanian athletics, multiple national champion (27 titles), participant in the 1952 Olympic Games in Helsinki, who was at the venerable age of 85 years, Aurel Palade-Ursu, Mircea Pop, Ilarie Măgdaş, Vasile Bogdan, Vasile Sărucan, Eva Zörgö, Ráduly Károly, Draga Comşa-Crişan, and others.

The project for the superelevation of the monument, scheduled for this year, was postponed until the next year’s edition, when it is intended to be inaugurated, in the presence of local off cials.

Traian Bocu
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The meeting point

Chatting: Ilarie Magdaş, Alexandra Taifas-Sicoe and Emma Konrad

The veteran athletes in a group picture. In the middle, the multiple champion Alexandra Taifas-Sicoe.

On the plateau in front of the monument

https://doi.org/10.26659/pm3.2017.18.3.173

FOR THE ATTENTION OF CONTRIBUTORS

The subject of the Journal

The journal has a multidisciplinary nature oriented toward biomedical, health, exercise, social sciences f elds, applicable in activities of physical training and sport, so that the dealt subjects and the authors belong to several disciplines in these f elds. 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; f tness; 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; inf uence of some ions on effort capacity; psychological prof les 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, f eld and table tennis, wrestling, sumo.

The authors of the two rubrics are doctors, professors and educators, from universities and preuniversity education, trainers, scientif c researchers etc.

Other rubrics of the journal are: the editorial, editorial news, reviews of the latest books in the f eld and others that are presented rarely (inventions and innovations, universitaria, preuniversitaria, forum, memories, competition calendar, portraits, scientif c 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 f eld. 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 f oppy disk (or CD-ROM) and printed, by mail at the address of the editorial staff. The works of contributors that are resident abroad and of Romanian authors must be mailed to the Editorial staff at the following address:

„Palestrica of the third millennium – Civilization and sport"
Chief Editor: Prof. dr. Traian Bocu
Contact address: palestrica@gmail.com or traian_bocu@yahoo.com
Mail address: Clinicilor street no. 1 postal code 400006, Cluj-Napoca, România
Telephone:0264-598575
Website: www.pm3.ro

Objectives

Our intention is that the journal continues to be a route to highlight the research results of its contributors, especially by stimulating their participation in project competitions. Articles that are published in this journal are considered as part of the process of promotion in one's university career (accreditation that is obtained after consultation with the National Council for Attestation of Universitary Titles and Diplomas).

We also intend to encourage the publication of studies and research, that include original relevant elements especially from young people. All articles must bring a minimum of personal contribution (theoretical or practical), that will be highlighted in the article.

In the future we propose to accomplish criteria that would allow the promotion of the journal to superior levels according international recognition.

THE STRUCTURE AND SUBMISSION OF ARTICLES

The manuscript must be prepared according to the stipulations of the International Committee of Medical Journal Editors (http://www.icmjee.org).

The number of words for the electronic format:

– 4000 words for original articles;

– 2000 words for case studies;
– 5000-6000 words for review articles.

Format of the page: edited in WORD format, A4. Printed pages of the article will be numbered successively from 1 to the f nal 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 f les: „f gure 1.tif", „f gure 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 f les, accompanied by a legend that will be put **above** the table.

PREPARATION OF THE ARTICLES

1. Title page: – includes the title of article (maximum 45 characters), the name of authors followed by surname, work place, mail address of the institute and mail adress and e-mail address of the f rst author. It will follow the name of article in the English language.

2. Summary: For original articles a summary structured like this is necessary: (Premize-Background, Obiective-Aims, Metode-Methods, Resultate-Results, Concluzii-Conclusions), in the Romanian language, of maximum 250 words, followed by 3-8 key words (if its possible from the list of established terms). All articles will have a summary in the English language. Within the summary (abstract) abbreviations, footnotes or bibliographic references should not be used.

Premises and objectives. Description of the importance of the study and explanation of premises and research objectives.

Methods. Include the following aspects of the study:

Description of the basic category of the study: of orientation and applicative.

Localization and the period of study. Description and size of groups, sex (gender), age and other socio-demographic variables should be given.

Methods and instruments of investigation that are used.

Results. The descriptive and inferential statistical data (with specif cation of the used statistical tests): the differences between the initial and the f nal measurement, for the investigated parameters, the signif cance of correlation coeff cients are necessary. The specif cation of the level of signif cance (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 f rst abbreviation in the text is represented f rst *in extenso*, having its abbreviation in parenthesis, and thereafter the short form should be used.

Authors must undertake the responsibility for the correctness of published materials.

4. Bibliography

The bibliography should include the following data:

For articles from journals or other periodical publications the international Vancouver Reference Style should be used: the name of all authors as initials and the surname, the year of publication, the title of the article in its original language, the title of the journal in its international abbreviation (italic characters), number of volume, pages.

Articles: Pop M, Albu VR, Vişan D et al. Probleme de pedagogie în sport. Educaţie Fizică şi Sport 2000; 25(4):2-8.

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

Chapters from books: Hăulică I, Bălţatu O. Fiziologia senescenţei. In: Hăulică I. (sub red.) Fiziologia umană, Ed. Medicală, Bucureşti, 1996, 931-947.

Starting with issue 4/2010, every article should include a minimum of 15 bibliographic references and a maximum of 100, mostly journals articles published in the last 10 years. Only a limited number of references (1-3) older than 10 years will be allowed. At least 20% of the cited resources should be from recent international literature (not older than 10 years).

Peer-review process

In the f nal stage all materials will be closely reviewed by at least two competent referees in the f eld (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 prof les. 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.

Conf ict of interest

The authors must mention all possible conf icts of interest including f nancial and other types. If you are sure that there is no conf ict of interest we ask you to mention this. The f nancing sources should be mentioned in your work too.

Specif cations

The specif cations 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 specif ed 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, f gures, 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 certif cate for doctors, for studies in human subjects;
- certif cate from the Bioethical Committees, for human study protocols;
- certif cate 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 certif cate from the Bioethical Committees.

Editorial submissions will be not returned to authors, whether published or not.

FOR THE ATTENTION OF THE SPONSORS

Requests for advertising space should be sent to the Editors of the "Palestrica of the Third Millennium" journal, 1, Clinicilor St., 400006, Cluj-Napoca, Romania. The price of an A4 full colour page of advertising for 2012 will be EUR 250 and EUR 800 for an advert in all 4 issues. The costs of publication of a logo on the cover will be determined according to its size. Payment should be made to the Romanian Medical Society of Physical Education and Sports, CIF 26198743. Banca Transilvania, Cluj branch, IBAN: RO32 BTRL 0130 1205 S623 12XX (RON).

SUBSCRIPTION COSTS

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

Payment of subscriptions should be made by bank transfer to the Romanian Medical Society of Physical Education and Sports, CIF 26198743. Banca Transilvania, Cluj branch, IBAN: RO32 BTRL 0130 1205 S623 12XX (RON), RO07 BTRL 01,304,205 S623 12XX (EUR), RO56 BTRL 01,302,205 S623 12XX (USD). SWIFT: BTRLRO 22

Please note that in 2010 a tax for each article submitted was introduced. Consequently, all authors of articles will pay the sum of 150 RON to the Romanian Medical Society of Physical Education and Sport published above. Authors who have paid the subscription fee will be exempt from this tax. Other information can be obtained online at www.pm3.ro "Instructions for Authors", at our e-mail address palestrica@gmail.com or at the postal address: 1, Clinicilor St., 400006, Cluj-Napoca, Romania, phone: +40264-598575.

INDEXING

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Palestrica Mileniului III – Civilizaţie şi Sport
Vol. 18, no. 3, Iulie-Septembrie 2017, 177–179

ÎN ATENŢIA COLABORATORILOR

Tematica revistei

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

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

Dintre articolele consacrate studiilor şi cercetărilor experimentale notăm pe cele care vizează: metodica educaţiei f zice şi sportului; inf uenţa unor ioni asupra capacităţii de efort; prof lul psihologic al studentului la educaţie f zică; metodica în gimnastica sportivă; selecţia sportivilor de performanţă.

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

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

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

Subliniem rubrica "Memoria ochiului fotograf c", unde se prezintă fotograf i, unele foarte rare, ale sportivilor din trecut şi prezent.

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

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

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

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

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

Obiective

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

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

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

STRUCTURA ŞI TRIMITEREA ARTICOLELOR

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

Numărul cuvintelor pentru formatul electronic:

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

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

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

Ilustraţiile:

Figurile (graf ce, fotograf i etc.) vor f numerotate consecutiv în text, cu cifre arabe. Vor f editate cu programul EXCEL sau SPSS, şi vor f trimise ca f şiere separate: „f gura 1.tif", „f gura 2. jpg", iar la solicitarea redacţiei şi în original. Fiecare graf c va avea o legendă care se trece **sub** f gura respectivă.

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

PREGĂTIREA ARTICOLELOR

1. Pagina de titlu: – cuprinde titlul articolului (maxim 45 caractere), numele autorilor urmat de prenume, locul de muncă, adresa postală a instituţiei, adresa poştală şi adresa e-mail a primului autor. Va f urmat de titlul articolului în limba engleză.

2. Rezumatul: Pentru articolele experimentale este necesar un rezumat structurat (Premize-Background, Obiective-Aims, Metode-Methods, Rezultate-Results, Concluzii-Conclusions), în limba română, de maxim 250 cuvinte (20 de rânduri, font Times New Roman, font size 11), urmat de 3–5 cuvinte cheie (dacă este posibil din lista de termeni consacraţi). Toate articolele vor avea un rezumat în limba engleză. Nu se vor folosi prescurtări, note de subsol sau referinţe.

Premize şi obiective: descrierea importanţei studiului şi precizarea premizelor şi obiectivelor cercetării.

Metodele: includ următoarele aspecte ale studiului:

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

Localizarea şi perioada de desfăşurare a studiului. Colaboratorii vor prezenta descrierea şi mărimea loturilor, sexul (genul), vârsta şi alte variabile socio-demograf ce.

Metodele şi instrumentele de investigaţie folosite.

Rezultatele vor prezenta datele statistice descriptive şi inferenţiale obţinute (cu precizarea testelor statistice folosite): diferenţele dintre măsurătoarea iniţială şi cea f nală, pentru parametri investigaţi, semnif caţia coef cienţilor de corelaţie. Este obligatorie precizarea nivelului de semnif caţie (valoarea ***p*** sau mărimea efectului ***d***) şi a testului statistic folosit etc.

Concluziile care au directă legătură cu studiul prezentat.

Articolele de orientare şi studiile de caz vor avea un rezumat nestructurat (fără a respecta structura articolelor experimentale) în limita a 150 cuvinte (maxim 12 rânduri, font Times New Roman, font size 11).

3. Textul

Articolele experimentale vor cuprinde următoarele capitole: Introducere, Ipoteză, Materiale şi Metode (inclusiv informaţiile etice şi statistice), Rezultate, Discutarea rezultatelor, Concluzii (şi propuneri). Celelalte tipuri de articole, cum ar f articolele de orientare, studiile de caz, editorialele, nu au un format impus.

Răspunderea pentru corectitudinea materialelor publicate revine în întregime autorilor.

4. Bibliograf a

Bibliograf a va cuprinde:

Pentru articole din reviste sau alte periodice se va menţiona: numele tuturor autorilor şi iniţialele prenumelui, anul apariţiei, titlul articolului în limba originală, titlul revistei în prescurtare internaţională (caractere italice), numărul volumului, paginile

Articole: Pop M, Albu VR, Vişan D et al. Probleme de pedagogie în sport. Educaţia Fizică şi Sportul 2000; 25(4):2-8.

Cărţi: Drăgan I (coord.). Medicina sportivă aplicată. Ed. Editis, Bucureşti 1994, 372-375.

Capitole din cărţi: Hăulică I, Bălţatu O. Fiziologia senescenţei. În: Hăulică I. (sub red.) Fiziologia umană. Ed. Medicală, Bucureşti 1996, 931-947.

Începând cu revista 4/2010, f ecare articol va trebui să se bazeze pe un minimum de 15 şi un maximum de 100 referinţe bibliograf ce, în majoritate articole nu mai vechi de 10 ani. Sunt admise un număr limitat de cărţi şi articole de referinţă (1-3), cu o vechime mai mare de 10 ani. Un procent de 20% din referinţele bibliograf ce citate trebuie să menţioneze literatură străină studiată, cu respectarea criteriului actualităţii acesteia (nu mai vechi de 10 ani).

Procesul de recenzare (peer-review)

Într-o primă etapă toate materialele sunt revizuite riguros de cel puţin doi referenţi competenţi în domeniu respectiv (profesori universitari doctori şi doctori docenţi) pentru ca textele să corespundă ca fond şi formă de prezentare cerinţelor unei reviste serioase. După această etapă materialele sunt expediate referenţilor revistei, în funcţie de prof lul materialelor. În urma observaţiilor primite din partea referenţilor, redacţia comunică observaţiile autorilor în vederea corectării acestora şi încadrării în cerinţele de publicare impuse de revistă. Acest proces (de la primirea articolului până la transmiterea observaţiilor) durează aproximativ 4 săptămâni. Cu această ocazie se comunică autorului daca articolul a fost acceptat spre publicare sau nu. În situaţia acceptării, urmează perioada de corectare a articolului de către autor în vederea încadrării în criteriile de publicare.

Conf icte de interese

Se cere autorilor să menţioneze toate posibilele conf icte de interese incluzând relaţiile f nanciare şi de alte tipuri. Dacă sunteţi siguri că nu există nici un conf ict de interese vă rugăm să menţionaţi acest lucru. Sursele de f nanţare ar trebui să

f e menţionate în lucrarea dumneavoastră.

Precizări

Precizările trebuie făcute doar în legătură cu persoanele din afara studiului, care au avut o contribuţie substanţială la studiul respectiv, cum ar f anumite prelucrări statistice sau revizuirea textului în limba engleză. Autorii au responsabilitatea de a obţine permisiunea scrisă din partea persoanelor menţionate cu numele în cadrul acestui capitol, în caz că cititorii se referă la interpretarea rezultatelor şi concluziilor acestor persoane. De asemenea, la acest capitol se vor face precizări în cazul în care articolul valorif că rezultate parţiale din anumite proiecte sau dacă acesta se bazează pe teze de masterat sau doctorat susţinute de autor, alte precizări.

Criterii deontologice

Redacţia va răspunde în timp util autorilor privind acceptarea, neacceptarea sau necesitatea modif cării textului şi îşi rezervă dreptul de a opera modif cări care vizează forma lucrărilor.

Nu se acceptă lucrări care au mai fost tipărite sau trimise spre publicare la alte reviste. Autorii vor trimite redacţiei odată cu articolul propus spre publicare, într-un f şier word separat, o declaraţie scrisă în acest sens, cu angajamentul respectării normelor deontologice referitoare la citarea surselor pentru materialele folosite (referinţe bibliograf ce, f guri, tabele, chestionare).

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